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Introduction

Executive Summary

The present deliverable is based on the results of the case studies conducted in the context of WP3, specifically derived from task T3.4 ("Synthesise the results of the case studies and elaboration of discussion papers and scientific articles") lead by INTERMÓN with the support of all other members of the consortium during months M20 to 27. This document collects the findings resulting from the research conducted in the project and, based on the gathered information, a discussion paper has been prepared to contribute to the knowledge about the social impact of green transitions. The case studies will provide a deeper understanding of green transitions in general and of climate and environmental policy interventions in particular, and their socio-economic impacts in Europe and in other regions of the world. This deliverable entails 15 research reports (5000-8000 words) with the systematized results of the case studies, focusing on the thematic areas addressed by the call in diverse national and regional backgrounds. The reports include an overview of the case, the addressed research questions, details on the methodology used, findings and results, a concise summary of the main findings of the case study, a section with discussion and conclusions, and recommendations based on them.

To address the diversity of results, an internal webinar was organised, aimed at identifying common patterns or specificities linked to sectors or cases, as well as insights that can inspire the redesign and improvement of just transition policies. The purpose of this session was to invite reflection and discussion in an argumentative, critical and open tone. The webinar was the germen of a discussion paper aimed at contributing to the alignment of case-study questions and the overarching project questions, inspired and guided by the Analytical Framework (D2.4). The discussion paper, *Reflection on GreenPaths case studies: identifying impacts of just transition policies in the EU and Global South*, improved the coherence and quality of the inputs generated for subsequent stages of the project, especially in what concerns the co-design of green transition pathways (WP5). This deliverable also contains information about dissemination actions based on these results.

The findings show that in general terms, the negative impacts draw a pattern of 'green sacrifice' and distributional inequality, where environmental and social benefits are unevenly distributed costs are externalised to vulnerable communities or peripheral regions. Environmental benefits are being offset by localised ecological degradation, green grabbing and commodification of nature. These phenomena are facilitated by a situation where technocratic governance is sidelining democratic processes through limited community participation and transparency. The green transition offers major environmental benefits—such as emissions reduction, biodiversity protection, and ecosystem restoration—alongside potential social gains like job creation, energy security, and improved living standards. However, these benefits are unevenly distributed and often aspirational, while negative impacts—inequalities, social conflicts, extractivist practices, and precarious employment—are immediate and tangible. Key challenges include weak public participation, fragmented governance, and methodological gaps in impact measurement. In response, promising initiatives promote democratic governance, transparency, and consent processes, supported by civil society activism, litigation, and social dialogue. State-led strategies advance renewable energy, technology transfer, and skills training, complemented by local models of inclusive development and international tools for monitoring climate finance and reducing carbon leakage.

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Keywords

GreenPaths; Case studies; Just Transition; Discussion Paper; Social Impact

Intended audience

This report is potentially of interest to stakeholders interested in the just green transition, in particular researchers (within and outside the GreenPaths consortium), policymakers and representatives of civil society organisations interested in gaining a succinct overview of the main ways in which just or fair green transition policy interventions are linked to environmental sustainability and social wellbeing.

Reading recommendations

This deliverable concludes the work carried out under WP3 (months M8–M27), based on research conducted by 11 consortium partners. It includes 15 case studies that provide insights into the social and environmental impacts of just transition policies in the EU. For context, we recommend reading D2.4, which introduced GreenPaths' draft analytical framework. The concepts and processes of social impact from that framework have been integrated into the CMM (D3.1). The following sections outline the scope of the deliverable, the organization of the work, and the document's approach, including abstracts of the listed reports, sectors and concepts linked to each case study, and details on how the work was structured. Each case study follows a similar format—overview, research questions, methodology, findings, summary, discussion, and recommendations—facilitating comparison, identifying unique features, and extracting common patterns. The discussion paper, defined by D2.4 and D3.1, summarizes general trends observed and discussed during an internal webinar. It includes an overview of environmental and social wellbeing impacts, key challenges faced by stakeholders, promising initiatives, and a final section with conclusions and recommendations. The dissemination actions based on the outputs of the case studies have been detailed after the discussion paper. References have been placed at the end of the document and organized by case study to make the main text easier to read.

Scope

Both qualitative and quantitative approaches were used to identify and assess impacts across economic sectors and social groups in 10 European countries – 9 EU member states and one EU candidate; namely Croatia, France, Germany, Italy, The Netherlands, Portugal, Romania, Serbia, Slovenia and Spain, which represent diverse geographical contexts and socio-economic trajectories – and four regions of the Global South (Sub-Saharan Africa, Asia, Latin America, and North Africa), addressing the impacts of policy interventions at both the European and international levels.

The deliverable collects a synthesis WP3 results and reflects the outcomes a join task aimed at finding common patterns and main differences between the different case studies to answer the research questions of the GreenPaths project. This process was based on and articulated by the analytical framework (D2.4) and the conceptual and methodological matrix (D3.1). It also integrated a systematic, comparative analysis and synthesis of the results collected in D3.3.

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The discussion paper *Reflection on GreenPaths case studies: identifying impacts of just transition policies in the EU and Global South* describes the linkages between green transition policy interventions, environmental sustainability and social wellbeing. This document will be uploaded to the GreenPaths Hub as a key outcome and reference document of the project. Additionally, with the least amount of edition can be used as potential contributions for forthcoming publications (responses for CFPs, book chapters, etc.). The dissemination actions based on the case studies listed at the end of the document contribute to the goal of preparing scientific articles and discussion papers to contribute to the knowledge about the social impact of green transitions.

Deliverable 3.4. and Task 3.4. draw from WP2 deliverables D2.1 (indicators) and D2.4 (analytical framework) and conclude the work developed through the preceding tasks:

- Task 3.1 - Elaborate a conceptual and methodological matrix and a common reporting template for the case studies, to facilitate comparative analysis and synthesis
- Task 3.2 - Carry out a set of 15 case studies to provide a deeper understanding of the linkages between policy interventions, environmental sustainability and social wellbeing
- Task 3.3 - Assess the environmental and social costs and benefits of green transitions in different regions and countries of Europe and in the Global South

This deliverable, along with the work developed throughout the WP3 will contribute to the tasks and deliverables of WP5, focused on the co-design of green transition pathways.

Organization of the work

Case study reports

The case study reports reflect the work done during the execution of task T3.2. ("carry out a set of 15 case studies to provide a deeper understanding of the linkages between policy interventions, environmental sustainability and social wellbeing"). All the members of the consortium collaborated with the task and deliverable. The 15 case studies were led by 11 partners: CES, INTERMON, IPE, JLU, PNG, POLICY LAB, RISTECO, TNI, UC, UvA, Zajednicko (Table 1). Peer review was decentralized, according to the division of tasks and case study partnership selection that took place in the context of T3.1. Each case study was led by one organisation and supported at least by other two organisations, responsible for different types of assistance (methodological counselling, exchanges of results, review of the final outcomes, etc.).

Table 1. Number of case studies led by each partner

Partner	Number of case studies	Cases
CES	2	• *Case study 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal.* • *Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania*
INTERMON	1	• *Case study 3: Just Transition Agreements – Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)*

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Partner	Number of case studies	Cases
POLICY LAB	1	• *Case study 4: Assessing the Impacts of the Common Agricultural Policy (CAP) in Land Use in Slovenia, Croatia and Serbia*
TNI	4	• *Case study 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective* • *Case study 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions* • *Case study 7: The Paradoxes of Green Industrial Policy in Southern Africa* • *Case study 8: Green Industrial Policy in North Africa: Between Energy Sovereignty, Authoritarian Governance and Neocolonial Extraction*
UC	1	• *Case study 9: Climate finance and its distribution in the EU*
JLU	1	• *Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South*
UvA	1	• *Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?*
Zajednicko	1	• *Case study 12: Mining Lithium in Serbia*
IPE	1	• *Case study 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations*
PNG	1	• *Case study 14: Energy poverty in Central and South-Eastern Europe*
RISTECO	1	• *Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study*

The authorship of the reports is detailed in Table 2.

Table 2. Authorship of the case study reports

Case study	Leading partner	Authors
Case study 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal.	CES	Gea Piccardi (CES); Mariana Riquito (CES); Marcus Erridge (CES); Irina Velicu (CES)

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Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania	CES	Romana Puilet (RISE project); Marcus Erridge (CES); Gea Piccardi (CES); Irina Velicu (CES)
Case study 3: Just Transition Agreements – Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)	INTERMON	José María Zavala Pérez (Oxfam Intermon)
Case study 4: Assessing the Impacts of the Common Agricultural Policy (CAP) in Land Use in Slovenia, Croatia and Serbia	Policy Lab	Ajda Pistotnik (Policy Lab), Arne Kušej (Policy Lab)
Case study 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective	TNI	Daniel Chavez (TNI)
Case study 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions	TNI	Jewellord Nem Singh (University of Sussex), Daniel Chavez (TNI)
Case study 7: The Paradoxes of Green Industrial Policy in Southern Africa	TNI	Donna Andrews (University of Cape Town), Daniel Chavez (TNI)
Case study 8: Green Industrial Policy in North Africa: Between Energy Sovereignty, Authoritarian Governance and Neocolonial Extraction	TNI	Hamza Hamouchene (TNI), Daniel Chavez (TNI)
Case study 9: Climate finance and its distribution in the EU	UC	Judith Clifton (UC), Daniel Díaz-Fuentes (UC), Marcos Fernández Gutiérrez (UC), Ana Lara Gómez (UC)
Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South	JLU	Thomas Kopp (Justus-Liebig-University Giessen), Syeda Aimen Abbas (Justus-Liebig-University Giessen)
Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?	UvA	Yannick van den Berg (UvA), Aleksa Radonjić (UvA)
Case study 12: Mining Lithium in Serbia	Zajednicko	Tatjana Avramović (Zajedničko), Janko Stefanović (Zajedničko), Andrej Ivančić (Zajedničko), Predrag Momčilović (Zajedničko)

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Case study 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations	IPE	Vedran Horvat (IPE)
Case study 14: Energy poverty in Central and South-Eastern Europe	PNG	Antonija Komazlić (PNG), Mauro Sirotnjak (PNG), Filip Pračić (PNG)
Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study	RISTECO	Maurizio Mariani (RISTECO), Chiara Falvo (RISTECO), Claire Marie Mariani (IUC)

The structure of the case study reports was designed as a standardized scientific article, with the purpose of generating similarly articulated reports, allowing their joint meta-analysis, and facilitating their subsequent adaptation to journal articles to increase impact and dissemination. The standardized structure is detailed in Table 3.

Table 3. Structure of the case study reports

Section	Description
Overview	Introduction, grounding, context and focus of the case study. Why it's important and how it ties into the GreenPaths project.
Research questions	Identification of the research questions and how they help answer GreenPaths primary research questions. List of the variables and social impacts the case will investigate.
Methods	Methodological approach of the case study, selection of indicators and tools
Findings and Results	Results of the data analysis, key findings relating to the research questions and indicators.
Main Results	Concise summary of the main findings of the case study, with specific reference to the environmental and social costs and benefits of green transitions
Discussion and Conclusions	Section summarizing the final reflections of the case, bringing in some reflection of the analytical framework and what the case brings to the wider aims of the GreenPaths project.
Recommendations	Takeaway recommendations from the case, in relation to the overarching remit of GreenPaths
References	Include a full list of sources, cited using APA style (listed at the end of the deliverable)

Webinar and discussion paper

The case study webinar took the form of an online roundtable in two sections. Given the number of partners and cases, the participating case studies were divided into two groups (broadly done so through connecting the key concepts of the case studies). Each group worked as a roundtable, led by a different discussant, with reflections on the case study findings prompted by 2 questions that are designed to a) align with GreenPaths central research and empirical questions and b)

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encourage cross-case discussion on the key findings of partners' diverse case studies. Each group of case studies reflected on the same 2 questions:

> Q1. *To start, let's return to the first GreenPaths guiding question: How are green transition policies impacting environmental sustainability and social wellbeing? Based on this overarching question, could you now elaborate on the specific social impacts—costs and benefits—that have been most evident in your case study?*
>
> Q2. *What are the primary challenges and most promising initiatives your case study identified regarding how different actors (e.g., local communities, the State, social movements, private companies, or the EU) responded to the socio-economic or environmental impacts of green transition policy? In your response, you are welcome to explore different aspects—depending on your main findings—such as governance and coordination issues at different scales, as well as initiatives related to mitigation, adaptation and restoration.*

During the discussion, partners were encouraged to share their results and deliberations regarding positive and negative social and environmental impacts, differences in the impacts for collectives and key stakeholder problematics as well as responses from actors to these impacts, and policy design issues at different levels. Reflections on opportunities, best practices or promising initiatives, primary challenges and future scenarios were also welcome.

Approach

The overall objective of WP3 is to provide a comprehensive, in-depth and empirically grounded assessment of the linkages between green transition policy interventions, environmental sustainability and social wellbeing. The specific objectives of WP3 are:

- To produce a comprehensive and in-depth assessment of the linkages between European policies, environmental sustainability and social wellbeing based on a broad set of case studies representative of different geographical contexts, welfare models and/or transition challenges.
- To provide an assessment of the social and environmental impacts of EU policies within Europe and in other parts of the world (focusing on the externalities of European policies in the Global South).

The selection of case studies is based on four criteria: (1) comparability, complementarity, and learning potential related to the project goals and expected impacts; (2) feasibility in the given timeframe; (3) opportunities to build on previous and ongoing research work conducted by GreenPaths participants and access to existing networks and data, and (4) representativeness and geographical coverage. Although not every participant has a permanent institutional presence in all these countries and regions, the consortium as a whole has a vast network of relevant and useful contacts in various governmental and non-governmental institutions, within and beyond Europe, which facilitated data collection. The contents of this deliverable were conceived according to a scientific approach, following the Analytical Framework (D2.4) and the Conceptual and Methodological Matrix (D3.1). Both qualitative and quantitative approaches were used to identify and assess impacts across economic sectors and social groups. The case studies were linked to specific sectors, as defined in WP1, and related to different sectoral, project and case study concepts (see Table 4).

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Table 4. Sectors and concepts linked to the case studies

Case Study	Sector	Concepts
Case study 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal.	Social Welfare, Equality, Employment, Accessibility and Inclusion	• Decarbonisation • Renewables • Green-grabbing
Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania	Food, Land Use and Agriculture	• Decarbonisation • Eco-social State/Public Services • Green-grabbing
Case study 3: Just Transition Agreements – Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)	Social Welfare, Equality, Employment, Accessibility and Inclusion	• Decarbonisation • Fossil fuel phase-out
Case study 4: Common Agricultural Policy (CAP) on land use in Slovenia	Food, Land Use and Agriculture	• Land concentration as structural inequality and exclusion • The political ecology of land under CAP • Degrowth and just transitions in rural Europe
Case study 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective	Finances and Industrial Production	• Resource sovereignty • Developmental state • South-South cooperation • Strategic sectors • Structural transformation
Case study 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions	Finances and Industrial Production	• Developmental state • Strategic upgrading • Technology sovereignty • Industrial commons • Export-led industrialisation
Case study 7: The Paradoxes of Green Industrial Policy in Southern Africa	Finances and Industrial Production	• Beneficiation • Resource sovereignty • Developmental state capacity • Just transition • Industrial diversification

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Case Study	Sector	Concepts
Case study 8: Green Industrial Policy in North Africa: Between Energy Sovereignty, Authoritarian Governance and Neocolonial Extraction	Finances and Industrial Production	• Green colonialism • Export-oriented development
Case study 9: Climate finance and its distribution in the EU	Finances and Industrial Production	• Inequality in green finance distribution. • Left-behind regions.
Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South	Energy and climate	• Decarbonisation and other environmental policies • Distributional impacts • Carbon leakage
Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?	Energy and climate	• Sustainable growth • Decarbonisation • Renewables Fossil fuel phase out • Hydrogen • New extractivism Green/ landgrabbing
Case study 12: Mining Lithium in Serbia	Energy and climate	• Decarbonisation • Renewables
Case study 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations	Social Welfare, Equality, Employment, Accessibility and Inclusion	• Urbanisation • Housing • Sustainable growth
Case study 14: Energy poverty in Central and South-Eastern Europe	Social Welfare, Equality, Employment, Accessibility and Inclusion	• Eco-social state/ public services • State-aid • Green finance and Renewables • Housing
Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study	Food, Land Use and Agriculture	• Sustainable public procurement • Healthy school meals • Farm-To-Fork Strategy (F2F)

Case study abstracts

Case 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

The 'Mina do Barroso' case has become emblematic of the struggle between the push for decarbonization and 'green mining'—driven by international and national policies on critical mineral extraction—and the need for social, cultural, and environmental protections. This case study mobilizes the concept of Green Sacrifice Zones (GSZs) to unpack the sacrificial logics present in key enabling policies, pro-lithium discourses, and processes of loss, damage and injustices experienced or anticipated by local communities impacted by the granting, public consultation and prospecting processes of Mina do Barroso. Through Critical Discourse Analysis (CDA) and content/keyword analysis of primary and secondary data, the case study reveals gaps in the socioeconomic benefits promised by advocates of 'green mining'. It also exposes a minimization of environmental protection policies and an exacerbation of processes of rural marginalization and peripheralization. This poses a risk of erasing a unique and sustainable historical, agricultural, cultural, and social system.

Case 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania

This case study examines the social impacts of large-scale conservation in Romania's Carpathian Mountains, focusing on the Foundation Conservation Carpathia's (FCC) 'Europe's Yellowstone' project. It addresses a critical research gap in understanding how green transition policies around forest conservation, under the EGD and Biodiversity Strategy, affect rural communities. Through mixed methods —including policy analysis, media review, and stakeholder interviews— the study investigates whether ostensibly progressive conservation agendas perpetuate green-grabbing and sacrifice zones. Findings reveal significant socio-environmental trade-offs: increased biodiversity protection and rewilding coincide with dispossession, criminalization, cultural erosion, and economic marginalization of local communities. The research contributes to broader literature on environmental justice by applying a 'green sacrifice zone' framework to non-extractive contexts, demonstrating how fortress conservation exacerbates inequalities. It concludes that convivial conservation can help prevent the risk of EU-backed transition policies replicating colonial patterns under a green guise.

Case 3: Just Transition Agreements – Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)

This case study examines the social impact of the Just Transition Agreements (JTAs), the main instrument developed to implement the Spanish Just Transition Strategy in territories affected by the closure of coal mines and thermal and nuclear power plants. The study evaluates how just transition policies affect the social well-being of communities impacted by the closure of thermal power plants and mining operations in the Spanish regions of El Bierzo and Laciana (León). It identifies key achievements, advantages, challenges, and insights relevant for other JTAs and policymaking processes in Europe. The main target group is the population at risk due to decarbonisation policies, addressing aspects such as employment quality, adaptability to new processes, perceptions compared to other regions, training and skill updates, and the impact on the productive and social fabric of affected areas. The stakeholders interviewed highlight the late and insufficient intervention to address the economic impacts resulting from the closure of mining facilities and power plants.

Case 4: Assessing the Impacts of the Common Agricultural Policy (CAP) in Land Use in Slovenia, Croatia and Serbia

This case study examines the socio-environmental impacts of the EU's Common Agricultural Policy (CAP) on land use and rural livelihoods in Slovenia, Croatia, and Serbia, three countries shaped by a post-socialist 'triple transition' of agrarian reform, market liberalisation, and EU integration. Despite CAP's stated aims of sustainability and rural renewal, its area-based direct

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payments reinforce land concentration, marginalize smallholders, and fuel rural depopulation. The research addresses a gap in studies of the CAP's distributive effects in Southeast Europe by asking: How does CAP shape land use and access in these countries, and what does this reveal about the social justice dimensions of the EU's green transition? Findings show that large agribusinesses (e.g., Perutnina Ptuj, Panvita, Agrokor/Fortenova, Al Dahra) capture subsidies and land, while small farmers—especially women and youth—face systemic exclusion. Conceptually, the study contributes to critical agrarian, political ecology, and degrowth literature, highlighting how CAP's green transition policies reproduce structural inequalities.

Case 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective

This case study examines the challenges and opportunities for green industrial policy in Latin America, focusing on how countries in the Global South balance the demands of mineral extraction for global green technologies, development needs, and climate action. While Costa Rica and Uruguay have successfully implemented state-led renewable energy programmes, the 'lithium triangle' (comprising Argentina, Bolivia, and Chile) faces increased extractivism that benefits elites and transnational corporations rather than local communities. Resource nationalism often perpetuates dependency patterns, characterised by limited technology transfer. The study highlights that the success of green industrial policies largely depends on state capacity, democratic participation mechanisms, and regional cooperation frameworks, rather than resource endowments alone, challenging both neoliberal and deterministic pessimistic narratives.

Case 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions

This case study examines green industrial policy in Southeast Asia, exploring how developmental states with established industrial upgrading abilities handle green transitions while maintaining competitive positions in global value chains. The research question asks: Can Southeast Asian developmental state models achieve ecological sustainability without compromising economic dynamism and poverty alleviation? Findings reveal that, although countries like Vietnam, Thailand, and Malaysia have quickly implemented relatively successful national policies through effective state coordination, export-oriented industrialisation patterns often reproduce precarious labour conditions and environmental pollution despite 'green' labelling. The study shows that Southeast Asia's developmental states have strong institutional capacities for coordinated green transitions that exceed market-led approaches; however, democratising these processes remains essential for truly fair outcomes.

Case 7: The Paradoxes of Green Industrial Policy in Southern Africa

This case study examines the challenges of Southern Africa's green industrial policy at the intersection of critical mineral wealth, energy transition needs, and structural economic vulnerabilities. Although the region – in particular South Africa, Zimbabwe, Namibia, and Botswana- possesses significant resources for the global green transition (such as platinum, cobalt, lithium, and manganese), the shift toward sustainable industrialisation encounters tensions between export-driven extractivism and domestic beneficiation strategies. South Africa's Just Energy Transition Investment Plan and Presidential Climate Commission framework propose innovative governance strategies that aim to balance decarbonisation efforts with job preservation. However, communities dependent on mining face job losses without sufficient support for the transition, foreign firms predominantly control the emerging green hydrogen sector, and local content policies encounter implementation challenges. To ensure a successful and genuine 'green' transition, it is crucial to strengthen the state's capacity, encourage

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democratic participation, and establish regional cooperation frameworks to avoid repeating past patterns of resource extraction that fail to create added value.

Case 8: Green Industrial Policy in North Africa: Between Energy Sovereignty, Authoritarian Governance and Neocolonial Extraction

This case study investigates green industrial policy in North Africa, highlighting the tension between bold renewable energy goals and neocolonial extraction practices. The research question asks: Can North Africa's green transition meet its domestic development needs, or does it mainly replicate historical patterns of resource extraction that serve European energy security? Results show that despite substantial renewable energy efforts – Morocco aiming for 52% renewables by 2030 and Tunisia 35% – export-focused green hydrogen projects, privatisation agendas driven by international financial institutions, and the ongoing Moroccan occupation in Western Sahara through 'green' infrastructure illustrate how the energy transition risks increasing dependency rather than promoting true sovereignty. The study adds to discussions on green colonialism by illustrating how the EU's hydrogen strategy and World Bank-IMF structural reforms influence North Africa's energy trajectories, prioritising European energy security over local needs and democratic engagement.

Case 9: Climate finance and its distribution in the EU

This case study investigates the extent to which the European Investment Bank (EIB), as implementer of the European Green Deal Investment Plan (EGDIP), delivers on the promise (as a policy-taker of the EU) of a 'just transition' across EU regions. Despite political commitments to 'leave no one behind', concerns persist that climate finance may be disproportionately directed towards urban regions, which are both more responsible for climate change and better positioned to attract finance. The study addresses this gap by analysing the regional distribution of EIB climate finance between 2021 and 2023, using original data on 646 green projects. Two hypotheses are tested: whether urban regions attract more finance per capita, and whether vulnerable regions (as measured by the Green Transition Vulnerability Index, GTVI) receive more support. Findings confirm that cities and their commuting areas receive significantly more climate finance, while vulnerable regions do not. This challenges the equity of the transition and raises questions about the effectiveness of current policy tools.

Case 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South

This case study examines the distributional and environmental impacts of the European Union's green transition, addressing the gap in research that jointly considers social inequality and emission offshoring. While much of the literature on carbon leakage focuses on the EU Emission Trading Scheme (ETS) with inconclusive results, we employ the OECD's Climate Actions and Policies Measurement Framework (CAPMF) and its Environmental Policy Stringency Index (EPSI), which captures over 100 policy variables, to analyse the broader effects of environmental policy. The central research question asks whether stricter climate policies in Europe simultaneously (a) exacerbate income inequality at home and (b) shift emissions abroad. The analysis relies on panel data from 1990–2022 for inequality, unemployment, social expenditures, and trade data from 2016–2023 to derive imported emissions. The results suggest that policy stringency raises pre-tax and post-tax inequality but not disposable inequality, highlighting the protective role of welfare states in the Just Transition. At the same time, stricter environmental policies increase imported emissions from the Global South to the EU. The case study provides a

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joint view on domestic and global dimensions of the Just Transition debate, revealing undesired side effects of the existing policies.

Case 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?

This case study investigates the social impacts of the EU green hydrogen economy. It takes an energy justice perspective to enrich social impact analysis of hydrogen economies in two particular localities: Groningen in the north of the Netherlands and the Western Sahara a region recognized in international law as a non-self-governing territory, to which Morocco has territorial pretensions. Social impact assessments on (renewable) energy projects and systems, such as the EU-endorsed SLC-A, currently do not (sufficiently) assess the justice of green transitions (Fortier et al., 2019). This study builds on energy justice approaches to integrate additional indicators towards understanding the social impacts of green hydrogen and applies the resulting assessment framework to green hydrogen projects in Groningen and Western Sahara. This study shows how the introduction of green technologies and energy systems risks exacerbating distributional, procedural and recognition injustices where these concerns are not properly addressed in EU and national law and policy frameworks.

Case 12: Mining Lithium in Serbia

This case study explores the Jadar lithium mining project in Serbia to examine how EU decarbonisation and energy transition policies are shaping national strategies, political narratives, and institutional responses in a semi-peripheral context. Addressing a gap in the literature on green transition impacts beyond the EU core, the research asks how such policies influence governance practices and provoke local resistance. Using discourse analysis and the Loss and Damage framework, the study investigates environmental, social, cultural, and economic dimensions at the project, sectoral, and national levels. Key findings reveal that decarbonisation goals, while framed as sustainable, may justify extractive practices and marginalize communities. The case contributes to broader literature on green extractivism, environmental justice, and post-socialist development, demonstrating how EU-aligned climate policies can reproduce inequality and sacrifice local interests for global green agendas.

Case 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations

This study explores the state of art and potential for green transformation in Croatian tourism industry focusing on five key urban tourist hubs. Research addressed gap between growth-oriented tourism industry generating nearly 20% of the national GDP and unsustainable extractive practices that irreversibly change urban landscapes with their high environmental footprint, pressure on poor public infrastructure and detrimental impact on spatial/urban planning and housing. Some of the key research questions were: what is the transformative potential for ecological transition of tourism industry in Croatia, with focus on main urban touristic destinations? What are the key adverse environmental and social impacts of touristic activity in selected cities? Where are the key systemic obstacles for ecological transition in tourism sector? What are the cities responses and municipal policies to prevent or address adverse environmental and social impacts of (over) tourism? Findings have demonstrated that green transformation in the tourism industry is still underdeveloped at national/local level and that relatively weak regulation at the EU level does not play a decisive role in the green transformation of the whole sector. Furthermore, it has revealed a number of gaps in coordination between key local and national stakeholders in the tourism industry, cities and ministries accountable for green transition.

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Case 14: Energy poverty in Central and South-Eastern Europe

This case study examines energy poverty alleviation within the context of Central and South-Eastern Europe (CSEE), with focus on Croatia and comparative references to Slovenia and Serbia. The research addresses a key gap in data availability and policy implementation, particularly regarding housing tenure, undocumented dwellings and the accessibility of renovation schemes for vulnerable groups. The objective is to assess how EU-level frameworks are translated into national measures and whether these measures enable a socially just transition. The guiding research question is: How do energy renovation policies mitigate or reproduce social inequalities in the housing sector? Headline findings reveal persistent structural blind spots: the very groups most at risk (low-income households, elderly residents, single parents, tenants, rural communities and those reliant on solid fuels) are often excluded from funding schemes. Civil society organisations emerge as essential intermediaries yet remain underfunded and precariously positioned. The main contribution demonstrates that energy poverty is not merely a technical or welfare issue but is co-produced by -property relations, housing regimes, territorial distribution and governance structures, which advances the research on eco-social state transitions and policy design for just energy transitions.

Case 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study

Public procurement has increasingly emerged as a strategic policy lever within the European Commission's Green Deal and Clean Industrial Deal to drive sustainability, competitiveness and social equity. Likewise, the Farm to Fork (F2F) strategy recognizes public food procurement as a tool for sustainable and fair food systems. Yet, a research gap remains in understanding how these evolving frameworks can reconcile financial and regulatory pressures with the need for robust public investment and inclusive, community-driven approaches. This study addresses that gap by examining how public food procurement can integrate green and just transition principles while strengthening local economies. It focuses on the Dordogne school canteen model in France, which since 2018 has delivered 100% organic, local and homemade meals. The guiding research question asks: How can sustainable public food procurement simultaneously advance environmental goals, economic competitiveness and social equity? Our headline finding is that inclusive, sustainability-driven food procurement fosters healthier diets, reduces carbon footprints and boosts local farmer income without increasing costs. This study contributes a scalable benchmark for aligning EU procurement policy with systemic food system transformation.

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1 Case study reports

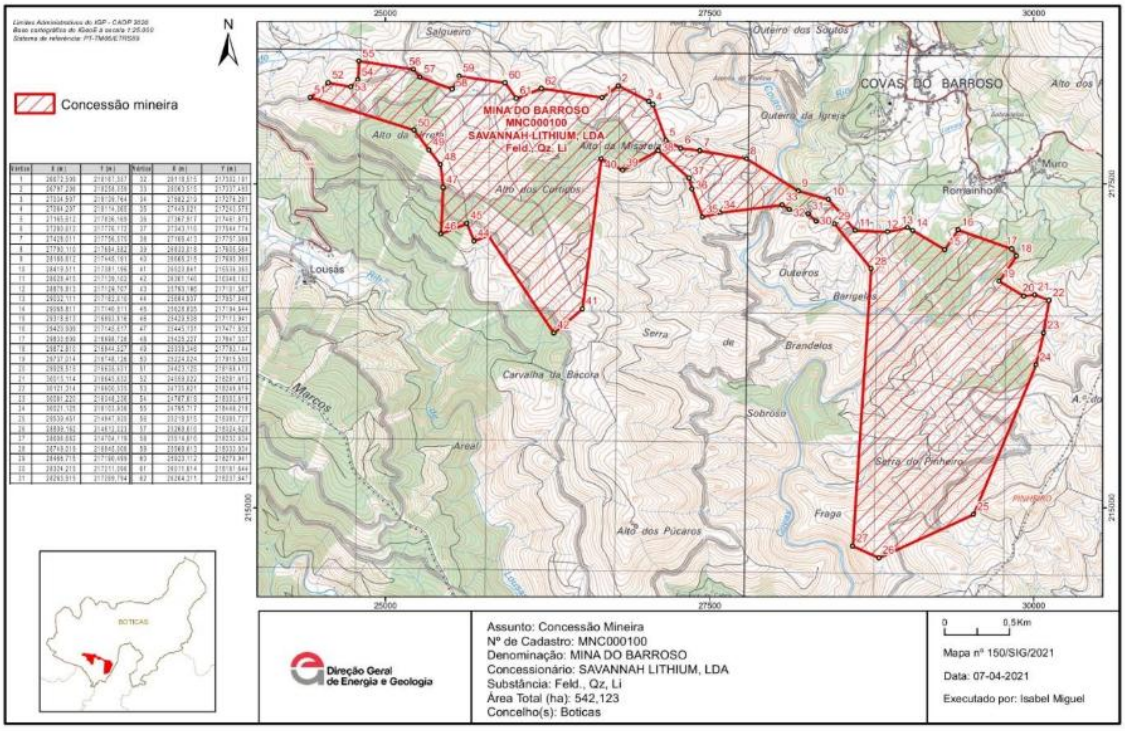
1.1 Case study 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal.

Overview

"It is not fair to sacrifice our community in the name of this false transition"
(Nuno, local farmer, fieldnotes, 19th March 2023).

This case study focuses on the proposed Mina do Barroso lithium project in Northern Portugal, specifically on the socio-environmental impacts of the policies that facilitate it. The case has become emblematic of the struggle between decarbonisation, driven by international and national policy on critical mineral extraction and lithium battery production, and social, cultural, environmental and heritage protections, drawing international attention as a potential sacrifice zone in Europe. The EU's acceleration of 'green extractivism', particularly through the Critical Raw Materials Act (CRMA), and Portugal's concomitant National Energy and Climate Plan (PNEC) bring this struggle into sharp relief.

Figure 1. Map of the Mina do Barroso concession mining area submitted by Savannah for prospecting [Source: Mapa, 2021]



The Barroso region is a mountainous agricultural area designated a Globally Important Agricultural Heritage System (GIAHS) by the UN. It sits on what are considered Europe's largest lithium reserves, placing Portugal among the top 10 global producers (Dunlap and Riquito, 2023, p.6). Tying into European Green Deal (EGD) targets to move production of electric vehicles to the EU—with batteries requiring 40% of local materials (EU Regulation 2023/1542)—Portugal's

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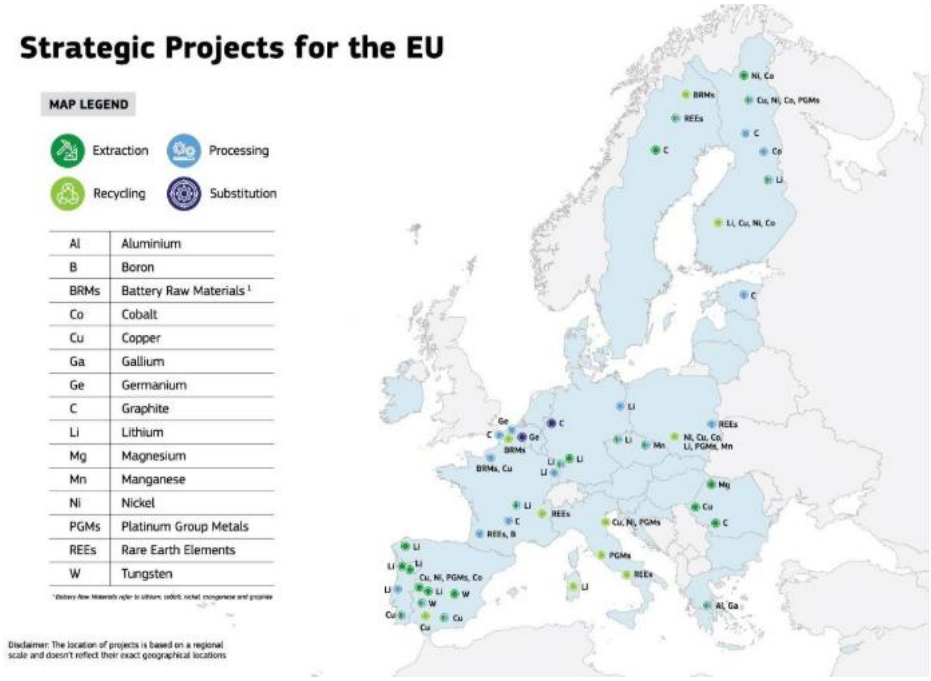
Secretariat of State for Energy (DGEG) created a Working Group on Lithium in 2016, encouraging applications for exploration and prospection licencing. By 2025, 22 lithium mining concession and prospection contracts have been approved (12 since 2016), 10 of which are in the Barroso region, including the 'Mina do Barroso' project in Covas do Barroso (Figure 1), owned by Savannah Lithium Lda. In 2024, the Portuguese state granted an administrative easement to Savannah to access land, and in 2025 the CRMA designated Minas do Barroso as one of 47 Strategic Projects (Figure 2).

Figure 2. EU Map of Strategic Projects marked under the CRMA. 2023 [Source: Renewables Now, 2025]



The process through which Savannah obtained a mining contract has been marked by legal and community disputes, as documented by several sources (Dunlap and Riquito, 2023; Iberian Mining Observatory, 2023; Silva and Sareen, 2023; Riquito, 2025). The company's first Environmental Impact Assessment (EIA) in 2020 was declared "non-compliant". Then, in 2022, the Portuguese Environment Agency (APA) again rejected the project over environmental concerns. Despite this, Portugal's DGEG enabled the company to resubmit its EIA, citing lithium's importance to the energy transition. The subsequent public consultation on Savannah's EIA did not follow the 30-day criteria (EU Directive 2011/92/EU). This procedural failure resulted in a 2021 complaint to the UN's Economic Commission for Europe (UNECE) accusing Portugal of violating the Aarhus Convention on public consultation in environmental projects—an accusation that was later confirmed by a ruling against Portugal in 2025. Despite 98% of the 916 received submissions opposing the project, the APA issued a conditionally favourable Environmental Impact Statement (DIA) in May 2023. That same year, a UN Special Rapporteur complained to the Human Rights Council about potential environmental and livelihood damage caused by Savannah's project, and the local Parish Council of Covas do Barroso filed for annulment of the DIA. In February 2024, the Portuguese Public Prosecutor argued that the DIA should be annulled due to legal infringements, yet the case remains undecided (Riquito, 2025). Finally, in 2025, APA granted the company one year of access to private and communal lands to conduct prospecting, in the name of national interest and against a precautionary injunction issued by local owners and supported by local opposition.

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While Minas do Barroso is among the most documented lithium projects in Europe, few studies offer qualitative data and analysis of different perspectives, drivers, social and economic impacts of the proposed mining project. Moreover, notwithstanding scholarly attention to green policies and their impacts in Barroso (Dunlap and Riquito; 2023; Saleth and Varov, 2023; Pusceddu, 2024; Riquito 2025), a significant gap remains in the analysis of the most recent EU and Portuguese national green transition policies. The present study contributes to fulfilling these gaps.

Research questions

This case asks:

Who are the key actors involved in the granting, public consultation and implementation processes of the proposed lithium mining projects in Barroso? How are they responding to the proposed lithium mining projects? How are specific State and EU policies enabling or preventing lithium mining in Barroso? What are the anticipated costs and benefits of lithium mining in Barroso? What are the alternative proposals?

In order to answer these questions the study employs the concept of "**green sacrifice zones**" (GSZs) (Brandajs, 2025; Zografos, 2022; Zografos and Robbins, 2020; Scott and Smith, 2017) to analyse the socio-ecological impacts of green transition policy as experienced and portrayed by different actors and community members in the region. The concept's relevance is grounded in both scholarly literature and empirical evidence, as local residents themselves repeatedly invoked the idea of sacrifice. Drawing on Environmental Justice and Political Ecology literature, the concept of GSZs emerged in the wake of recent (US and EU) Green Deal proposals and transition agendas, to expand the idea of conventional "sacrifice zones" (Juskus, 2023), proposing "that the logic of sacrificing a certain space or ecology can be expanded to include places and populations that will be affected by the sourcing, transportation, installation, and operation of solutions for powering low-carbon transitions, as well as end-of-life treatment of related material waste" (Zografos and Robbins, 2020, p.543). Furthermore, as the Green Deal policy drive is being supplanted by calls for EU defence and remilitarisation, we anticipate a creeping trend of "lithium for defence" arguments infusing the policy debate. Following Reinert's analysis on "projected sacrifice zones" (2018), this study treats GSZs not as a singular event but as an anticipatory, diagnostic tool that reveals the sacrificial logics embedded in policies and discourses that justify "green extractivism" (Dunlap et al., 2024), disproportionately affecting the Global South but also evident in prospective EU green mining projects, such as the 'Mina do Barroso' (Saleth and Varov, 2023).

This research therefore contributes to the literature about *the making of* GSZs in Europe not only by uncovering the multiple pre-extraction processes (**losses and damages, injustices, and inequalities**) experienced or anticipated by different actors and community members in Covas do Barroso, but also by highlighting the implicit/explicit, controversial and even conflictual **"green" sacrificial logics** that inform such processes, as detectable in planning and policy documents, official discourses, resistance, and decision-making processes. By highlighting how green extraction promoters justify or erase multiple harms, and by uncovering the anticipated losses, damages, and injustices experienced by the people of Barroso, the study answers GreenPaths' aim to illuminate the socio-ecological impacts (costs and benefits) of EU and Portuguese green transition agenda.

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Methods

This study employs a mixed-method approach using multiple data sources: academic and grey literature on Mina do Barroso and associated examples of green extractivism and green sacrifice zones in Portugal and the EU in general; key EU and national policies, focusing on the EU's Critical Raw Materials Act (CRMA) (2024) and Portugal's updated National Energy and Climate Plan (PNEC) (2024); fieldnotes from participant observation of daily life in Covas do Barroso, between April 2023 and April 2024, taken from the ethnographic doctoral research of Mariana Riquito, which included, participating in daily agricultural, social, or domestic tasks, as well as inhabitants' encounters and reactions to the growing transformations brought by the expansion of prospective lithium mining in the village; as well as excerpts from 18 semi-structured interviews with inhabitants from Covas, aged between 27 and 100 years old, mostly farmers, retired or working in care and social work; Savannah's promotional material; and two public CES events that engaged discussion of the case between social movements, local residents, NGOs and researchers: a March 2025 webinar *How the Lithium Rush is Producing Sacrifices Zones in Europe and Beyond* and an April 22 seminar *What are the challenges and paths for the energy transition in Portugal?*

The CRMA (2024) and PNEC (2024) were analysed using Critical Discourse Analysis (CDA) (Van Dyke, 1993; Cummings et al., 2020), while the remaining primary and secondary data were analysed using MAXQDA software, using thematic coding, keyword and content analysis of both the "manifest content" (i.e. that pertaining to de facto surface analysis around the occurrence of key words and the broad identification of central themes) and the "latent content" (i.e. hidden or insinuated meaning) (Sarantakos, 2005, p.300). CDA served to identify dominant discourses and language used to justify green (lithium) extraction. Keywords and content analysis enabled researchers to highlight the main (socio-economic-environmental) costs and benefits perceived by different stakeholders, including Savannah, Barroso residents, local authorities, activists and researchers.

The commissioning of Strategic Projects under the CRMA to meet the EU's call for lithium, decarbonisation and battery production for 'green technologies' are contextualised by Portugal's policy commitment to decarbonisation grounded in critical raw material extraction, namely of lithium, as highlighted in the updated version of the PNEC (2024) and in the 'Action Plan' of the CRMA Working Group.

We foreground the Barroso case with the following indicators: Portugal's share of renewable energy in total final energy consumption, 34.7% in 2022 (World Bank, 2022); the country has the largest reserve of lithium in Europe with an estimated 60,000 metric tons (Direct Industry, 2022); 22.0% of people are at risk of poverty or social exclusion in Northern Portugal (EAPN, 2024). However, these data points are merely benchmarks, any socioeconomic impacts are longitudinal - with the Barroso mine set to commence operations in 2027 and the next census in Portugal not due until 2031. Information gaps include a lack of detailed regional household surveys, disaggregated sociodemographic data, and indicators of intangible loss and damage, which are essential for intersectional analysis of the transition's true costs and benefits.

Applying the GreenPaths analytical framework and conceptual and methodological matrix (See GreenPaths D2.4 and D3.1), the case uses concepts of **decarbonisation**, **renewables, new extractivism**, and **green-grabbing** as filters, adopting the theoretical lens of Green Sacrifice Zones (GSZs) (Zografos and Robbins, 2020; Scott and Smith, 2017) and dimensions of Environmental Justice (EJ) to identify and analyse examples of key processes of social impact (**injustice/inequality** and **Loss and Damage**) related to lithium mining in the Barroso region—both ongoing (pre-extraction) and anticipated socio-environmental impacts- and the green-grabbing of private and communal (*baldios*) lands. The methodological tools applied in this study

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(CDA, the CRMA, the PNEC and the EJ framework) facilitate qualitative analysis and enable this case study to build on the existing literature. Applying this framework and lenses helps identify contingent themes of sacrificial logic in the preparation and formation of green sacrifice, linked to critical mineral policy at the EU and national level.

Findings and results

The key academic literature identifies the case for lithium extraction in Barroso and outlines the links between the Portuguese "lithium rush" and green energy policy at the international, EU and national level (Carvalho et al., 2021; Carvalho et al., 2022; Delicado et al., 2016; Chaves et al., 2021; Dunlap and Riquito; 2023; Pusceddu, 2024; Riquito, 2023; Riquito, 2025; Saleth and Varov, 2023; Silva and Sareen, 2023). For instance, Carvalho et al. (2022) analyses sociotechnical imaginaries of energy transition emerging from the RNC2050 and in context of EGD. Dunlap and Riquito (2023) critically engage in the topic of green extractivism by the "insidious social technologies of pacification" and counter-insurgency tactics deployed to further public acceptance of critical raw material extraction. Pusceddu (2024) analyses efforts to reframe mining and mineral extraction of the energy transition at the complex and contradictory intersection of environmental and economic anticipations. Riquito (2023) critically reflects on the dominant narrative of green transitions, rooted in a rhetoric of inevitability, which is legitimising extractivism and enclosing possibilities for alternatives. Riquito (2025) also explores the affective and embodied dimensions of resistance, rooted in re-existence for a place-based way of life in Barroso. Saleth and Varov (2023) explore the concept of "sacrifice zones" through a political ecology lens that analyses concepts of place and anticipation; focusing on identity of place and the mobilisation of anticipatory capabilities to prevent or secure imagined futures. Silva and Sareen (2023) engage with the term 'extractivism' to explore sociotechnical imaginaries around social movements and lithium mining.

The literature indicates a wide range of competing and contradictory motives, incentives, fears and concerns about lithium mining in the Portuguese context. It documents the perspectives of a wide range of stakeholders, including local residents, politicians, social movements, energy and mining companies; highlighting short, medium, long-term and intergenerational social impacts of green transition policy. CDA of key policies and excerpts from primary data containing the testimonies of local resistance actors involved in opposing the mine enriches this field with further context and texture.

Urgent Sacrifices for a "Green" Save: Logics of Sacrifice in EU and National Policies

The CRMA and Portugal's PNEC function as complementary instruments that deploy a convergent set of discursive strategies to fast-track mineral extraction for the green transition. CDA reveals how both policies construct a narrative of inevitability and manufactured urgency that systematically sidelines democratic integrity and environmental protection. The 'saving the planet' rhetoric that is foundational in both documents and drives the fast tracking of lithium extraction, appears to be just one rationale among others which, include military defence, geopolitical competitiveness and nationalistic pride. This theme is also explored in a new study by Vivoda et al. (2025) who map and unpack a typology of information manipulation in critical minerals governance, suggesting that the global green extraction projects is "as much about informational control as it is about material extraction". This urgency is explicit in the CRMA's expedited approval processes for Strategic Projects and emphasised by the Draghi Report, "*The Future of European Competitiveness*" (2024), which provides the broader strategic context and implementation path needed to make the CRMA successful. This push for urgency and fast-tracking is also echoed in the PNEC, particularly grounded in a missionary call for Portugal to be a "frontrunner" in achieving carbon neutrality five years ahead of the EU schedule. This

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accelerated timeline systematically sidelines substantive public consultation, dismissing profound ecological and social costs as mere short-term inconveniences on the path to a greater good (or against a possible military threat or economic competitor), constituting a clear procedural injustice. The "fast tracking" also forecloses deeper discussions about energy demand reduction. focusing instead on the need to switch energy sources.

Both documents employ deliberately ambiguous, positivist language to greenwash extraction and evade accountability. The CRMA operates as an investor-friendly blueprint, filled with hollow references to 'respect for' human rights based on toothless principles (e.g. EU principles for sustainable raw materials, 2021; UN Guiding Principles on Business and Human Rights, 2011; World Bank's International Finance Group (IFG) Performance Standard 5 on Land Acquisition and Involuntary Resettlement (2012)). Conversely, the CRMA could have cross-referenced international covenants and declarations (e.g. UN International Covenant on Civil and Political Rights (ICCPR), 1966; the International Covenant on Economic, Social and Cultural Rights (ICESCR), 1966; UN Declaration on the Rights of Indigenous Peoples (UNDRIP), 2007; UN Declaration on the Rights of Peasants and Other People Working in Rural Areas, 2018)) that link to existing UN mechanisms like the Universal Periodic Review (UPR) process and the Human Rights Council (HRC) complaints procedure that track access to, and violations of, fundamental rights under international human rights law. There is an overwhelming preponderance of 'slightly positive' and 'neutral' language concerning environmental and social impacts, reducing potential harms to vacuities to be avoided by 'applicants', with no formal recourse for opposing communities.

This strategic ambiguity is mirrored in the PNEC, which frames green economic growth as the undisputed panacea for social and environmental good. The Plan ties capitalist growth to renewable energy and mineral extraction, promising socioeconomic prosperity, job creation, and a Just Transition (JT). While a substantive integration of a JT framework is new for the Portuguese policy, its vision is narrowly defined. The PNEC reduces injustice to energy poverty and industrial workers' rights, ignoring intersecting axes of inequality (gender, race, class, rurality, etc.) and other affected groups like care/domestic workers (Barca et al., forthcoming), or (mostly rural) communities hosting renewable infrastructures and green mining projects (Delicado et al., 2016). Despite claiming projects should be "sustainable and beneficial for all stakeholders" (p. 23), the Plan fails to recognise rural communities as frontline subjects of the energy transition and omits their participatory rights. The opinions of local municipalities, for instance, are deemed "non-binding" (Decree-Law 30/2021, Article 16(3)).

Furthermore, the PNEC's environmental discourse is characterised by contradiction. On one hand, it emphasises the importance of ensuring that "mineral exploration and exploitation adhere to strict environmental sustainability principles" (p. 210)—though these are not specified—and explicitly mentions safeguarding areas protected under national and international law, such as UNESCO World Heritage sites, FAO Globally Important Agricultural Heritage Systems (GIAHS), and Natura 2000 zones. However, in practice, these commitments are nullified by the cross-referencing of the very CRMA framework that allows projects deemed of "overriding public interest" to bypass these protections (see also Marin et al., 2023, p.60). The EC's recent designation of the Barroso lithium mine, located within a protected GIAHS site, as a Strategic Project exemplifies this, sending a clear message that ecological and cultural values are subordinate to extractive goals. Ultimately, both policies insinuate collective EU and national support, homogenising 'win-all' benefits and leveraging promissory language to legitimise the very injustices they claim to avoid, all whilst offering no binding mechanisms for community recourse or environmental mitigation.

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Where there is no life, there can be no sacrifice – or the sacrifice of rural life.

Proponents of the Barroso lithium mine present it as a unique opportunity for green economic growth. Savannah Resources' CEO, Emanuel Proença, frames it as a geopolitical and strategic issue, stating: "Where there is a great need, there are opportunities of great value" (Rodrigues, 2024). The promised local benefits include new jobs and financial incentives - €485,000 to be distributed among members of the affected baldios, with an additional €125,000 per year; a payment of €0.65 per ton of spodumene concentrate sold for Covas do Barroso residents; and a flat donation of €290,000 to local volunteer firefighters (Savannah, 2024) - as well as infrastructure like new roads. The Mina do Barroso project, as claimed by Savannah, will create c.350 'direct' jobs and c.2000 'induced' jobs. Actual jobs created as of March 2025 (prior to mining operations commencing in 2027) are 40, 82% being Portuguese nationals, (70% male, 30% female) with 51% (20) purportedly hired from the region (ibid). These benefits, according to Proença, represent an opportunity to "revitalise" the Boticas area (Rodrigues, 2024). This conclusion is rooted in a pro-lithium narrative of rural decline, which describes the region as being "among the municipalities with the worst performance in economic and human development" (Ibid). Similarly, research on the Barroso mine funded by Savannah (Carballo-Cruz and Cerejeira, 2020) paints a picture of a region mainly characterised by depopulation, illiteracy, underdevelopment and enduring poverty - in other words: dying.

The "rural decline" is a powerful metaphor often used to pave the way for renewed processes of dispossession in Europe, justifying green extraction as a win-all project with no socio-economic costs (Del Mármol and Vaccaro, 2020). Rural Portugal, including Barroso, is indeed in crisis due to long-term processes of peripheralisation and "renewable energy colonialism" (Batel and Küpers, 2022; Batel et al., 2024; Poeta Fernandes, 2019). Where some locals have held out hope that the lithium mine could create employment and uplift the area (Pusceddu, 2024; Silva and Sareen, 2023; Conde and Le Billon, 2017), the majority of the local community fundamentally rejects the idea of a dying rurality in need of being saved and resurrected by the mine. Opponents criticise the sacrificial logic and intentions behind this discourse, arguing instead that the rural world is being sacrificed for the benefit of outside investors, companies, and the urban world.

The feeling of being sacrificed builds on perceived and experienced State neglect towards the region, as well as familiarity with prior renewable energy projects implemented in the area, which contribute to a growing fear of being sacrificed again for decarbonisation, which was frequently expressed during conversations or interviews. Residents argue that lithium mining destroys their environment and way of life to provide benefits, like green mobility, for urban populations (Wappelhorst, 2021) - a clear distributional injustice. This sentiment is rooted in a history of broken promises. Farmer Mafalda pointed to past projects, like the dams that seized homes and lands, which were justified as a public good but ultimately served private profit (Interview, 10 April 2024). Seeing the same pattern repeat, she condemned the lithium project as another case of "sacrificing us so they can line their own pockets." This echoes farmer Nuno's assertion that it is "not fair to sacrifice our community for this false" promise (Fieldnotes, 19 March 2023).

Residents oppose Savannah's extractive vision that equates life with metrics of economic growth and value creation with their defence of a "rural way of life" (see also Riquito, webinar, 2025), a "modo de vida" which "refers to a set of social, property, labour, family, and ecological relations, enacted and reproduced through specific, place-based practices, over generations, which sustain life in this place [Barroso]" (Riquito, 2025, p. 12). This *modo de vida* is understood as "truly sustainable" (Saleth and Varov, 2023, p.302) and opposes the mining project, as reflected in the "Yes to Life, No to Mining!" and "Mining is not Green, Green is Barroso" slogans used in Covas

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do Barroso protests. Opponents of the mine describe Barroso as a rich ecosystem characterised by unique historical-agricultural-cultural practices and intangible, life-making and place-based values where lithium mining would cause "irreversible damage" (Associação Unidos em Defesa de Covas do Barroso, MiningWatch Portugal, 2024, p.3).

This is corroborated by APA, which initially found the project a jeopardy to the region's GIAHS status (AIA 3353, 2022) yet still issued a conditionally favourable DIA. The municipality of Boticas warned the mine would cause the "irrecoverable destruction of the entire surrounding ecosystem and respective community" (2023 public consultation, p. 8). The threat encompasses multiple forms of environmental harms (see Section 3), as well as the expropriation of private and common lands or "green grabbing" (Dunlap and Riquito, 2023), which has been greatly enabled through administrative easements (UDCB 2024, p.5-6). Inhabitants anticipate displacement, often commenting "where will we go?" and fears over the disappearance of small-scale agriculture and traditional husbandry, which depend on communal lands and labour.

Locals refute Savannah's promised economic benefits, job creation promises and development ideology. First, they anticipate that demand for highly skilled labour will see jobs go to outsiders rather than locals, since the local population is ageing, lacks particular skills and qualifications, and does not want to work in the mine. As fieldwork observed, most subcontracted workers from Savannah are not from Covas, but from neighbouring villages. Second, residents fear the project will disrupt or even extinguish existing jobs in farming and other agricultural-related activities. As João, a local beekeeper stated: "Because of 3 jobs, more than 20 jobs are going to be destroyed? There are more than 20 farmers in Covas! For the locals, the mine isn't going to bring any profit at all" (Interview, 15th January 2024). or, in the words of a farmer during the first Camp in Defence of Barroso, in 2021, "for each job created by the mine, several [jobs], which are sustainable, are destroyed" (Fieldnotes, 15th August 2021). These sentiments echoed a commonly spread worry expressed by locals during fieldwork. Furthermore, there are fears that environmental harm created by the mine will greatly impact the quality of the products sold. For example, João talked about the honey produced in Barroso, which has won international awards, "[with the mine] the quality of the honey will be lost, the quality of every product which is produced here will be (Interview, 15th January 2024). This concern relates also to the risk of losing its unique GIAHS status, as APA's Evaluation Commission itself reports, and the Public Prosecutor's Opinion warns.

"There will have been no environmental harm": the sacrificial use of restoration

Socioeconomic costs articulated by residents are inextricably related to environmental harms - households' subsistence and social reproduction being dependent not just on land and labour, but also on "ecological assets" (Bruna, 2023, p.143). The Savannah lithium project includes four open-pit mines, a 24/7 processing plant, several waste facilities, as well as extensive transport infrastructure. The scale of mining paints a picture of profound and extensive alteration to the landscape, foreshadowing significant ecological consequences for the wider region (Riquito, webinar, March 2025). Different from socio-economic-cultural costs, denied and ignored by pro-lithium advocates, environmental costs are naturalised and even neutralised by the promise of mitigation of impacts and biodiversity restoration, two crucial ingredients of "green mining" (Dunlap and Brock, 2021 [2017], p.99). Portuguese Minister of the Environment and Energy in Portugal Graça Carvalho, who happens to be a mining engineer, argued that "there are always environmental impacts … the principle is to minimise them and … environmental science and technologies enable us to develop such kinds of projects" (Carvalho, 2024). This prominent counter-argument from lithium proponents suggests that ecological restoration can neutralise any

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damages, creating a 'no net harm' discourse. In this 'no loss, no damage' logic, there is no lasting sacrifice to mourn, only a temporary imbalance to be technically managed. Savannah embeds such techno-solutionism in its discourse. To support its image of a quintessentially "green" mine, the project entails mitigation and restoration measures as a prerequisite of CRMA Strategic Projects and APA EIAs. This includes a proposed closed-loop water system to avoid using the local river and plans to translocate protected species and create new conservation areas, "to restore the landscape and leave it in a better state than when we found it" (Savannah Resources former CEO Dale Ferguson in Mackay, 2022).

Residents, activists and experts reveal and reject the sacrificial logic behind the evidence-free promises by corporations and states of mitigation and restoration strategies of "accumulation by restoration" (Brock, 2023). The open-pit mine, waste dams and infrastructure threaten widespread pollution, soil degradation and catastrophic water contamination, jeopardising local springs and river basins. According to experts and the APA's Evaluation Committee, biodiversity faces irreversible harm, with critical risks of habitat fragmentation of endangered species (e.g. Iberian wolf, Freshwater Pearl Mussel and Shining Macromia dragonfly).

Savannah's mitigation measures are considered entirely insufficient. Its Environmental and Landscape Restoration Project (PARP) is criticised for lacking "positive impacts" and offering inadequate mitigation for the inevitable damage to landscape, soil, water and biodiversity. The sentiment that the plan treats the region as inherently expendable was widespread in the 2023 public consultation. One citizen argued, for instance, that "the mitigation plan... cannot be technically founded on the presumption of a sacrifice zone" (public consultation, 2023 p. 415). The water management strategy is a primary concern. Hydrologist Steven Emerman's report concludes that Savannah's plans are "highly experimental" and fail to comply with safety standards, particularly for waste infrastructure. This is alarming given the company's own contingency to capture water "directly from the Covas River" in case of shortage (which questions the companies' 'closed loop' claims). Furthermore, the project's climate impact is severe, with estimates showing it would cause a sixfold increase in the municipality's carbon emissions, a factor glaringly omitted from the EIA (UDCB, 2024 p.7).

The anticipation of irreversible environmental harm is reinforced by lived experience of the abandoned Minas da Borralha, which mined Wolframite from 1903 until 1986, and left "empty houses... and visible environmental degradation" (Dunlap and Riquito, 2023, p.11). Inhabitants contest Savannah's claims because they are already witnessing immediate impacts and fundamentally do not trust the mining company's promises. The first exploratory drillings in 2017, for example, triggered local resistance, as residents directly perceived the severe environmental consequences of those interventions, which the company never "restored", despite assurances to the contrary. Since May 2023, after the project DIA was approved, residents have continued to report significant environmental damage. Noise pollution has become a daily burden. As one farmer expressed: "Today there's only one, some days there are more machines, and it's truly unbearable... for those of us who are used to hearing the birds only" (Fieldnotes, 19th March 2023). Equally disruptive is the creation of spoil heaps (*escombreiras*), created during exploratory drillings, which have left scars on the landscape. Another farmer commented: "It used to be such a good place, we would go there to the woods and look at it now! This is a spoil heap, nothing more! They say that in the end they will restore it all, but that's a farce!" (Fieldnotes, 7th March 2024).

Water precarity remains one of inhabitants' greatest fears, as water is a vital element in organising life in Covas (Riquito 2025). One farmer spoke at a location where the company was conducting prospecting works: "they are not complying with what they claim: they do not have authorisation

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to draw from the streams. All the water that is collected and used should be done in a closed loop" (Fieldnotes, 5th March 2024). The water used in the prospecting was observed to be subsequently discharged into a brook, a tributary of the Covas River. "And do we not have reason to be concerned?! There are meadows further downstream that are irrigated with this water!" (Ibid). Prior to mining explorations, the farmer would drink water from any stream and from the river, but now he has to be more careful. The fear caused by the prospect of an open-pit mining operation, which foresees a use of water far exceeding local consumption, alongside the use of chemical products and reagents, is amplified by the exploratory activities of the mining company, which are already disturbing the socio-ecological realities of the local way of life.

Overall, opponents believe no mitigation or restoration can compensate for the project's fundamental destructiveness. The local Parish Council concludes that livelihoods will be "completely altered and affected", a point powerfully underscored by Aida Fernandes, president of the Baldios, who contends: "the mine will destroy everything that we possess... It will destroy our identity... our land... our rivers, our waters. And that is not reversible!" (cited in EEB, 2023 p.62).

The sacrificial logic presented here is based on techno-restoration presented as a *real* neutralisation of impacts. The harm is pre-emptively declared null and void by the future promise of repair as if, in Reinert's (2018 p.609) words, "there will have been no [environmental] violence". This is stated in the EU Regulation 2024/1991, underpinning Portugal's restoration plan: "[w]here, [...] an area is transformed from one habitat type falling within the scope of this Regulation to another habitat type falling within the scope of this Regulation, the area *should not be considered to have deteriorated*" (7, italics added).

Similarly, when the CRMA references environmental protection and mitigation requirements (EU Directives 2000/60/EC, 92/43/EEC, 2009/147/EC), they are essentially phrased in ways that insinuate barriers are navigable: "It should be possible to authorise Strategic Projects which have an adverse impact on the environment", and when the technical and legal promises are ticked off, the public interest served by the project can override those impacts (CRMA, p.6, Art.27). Through this logic, Strategic Projects are approved in protected Natura 2000 and GIAHS sites such as Barroso. Consequently, where these international environmental protection frameworks offer communities tools of resistance, they are also circumvented through the strategic promise of technocratic restoration. In recognising Mina do Barroso as a Strategic Project, the EC essentially said: globally recognised biodiversity, ecological, cultural and agro-historical practices are less important than lithium.

If there are no costs, any opposition is irrational

The sacrifice of community participation in decision-making processes and the missing "right to say no" highlighted by the Special Rapporteur (Boyd, 2023) is a consequence of both the fast-tracking logic imposed by policy frameworks and the denial of any socio-environmental costs by pro-lithium advocates. As addressed by the existing literature, the Mina do Barroso case reveals serious concerns about public information, participation, consultation procedures and the approval of mining licenses (Dunlap and Riquito; 2023; Saleth and Varov, 2023). This was recently confirmed by the UNECE Aarhus Convention Committee, which in August 2025 ruled that Portuguese agencies violated the treaty with regards to public consultation. Specifically, APA did not respond to requests for information within the legal timeframe and, when refusing, neglected to inform citizens of their appeal options. The mining authority (DGEG) also breached the Convention by improperly redirecting a request. The Committee also determined that the 2023 public consultation was flawed, highlighting systemic legal issues in Portugal, such as excessively brief comment periods and limited document disclosure.

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Since the very beginning of the project, the local population has not participated meaningfully in decisions regarding the future of their territory, and when concerns and opposition emerged, they have been systematically dismissed. After the first meeting organised by Savannah in the Romainho Chapel in Boticas, a local said: "our opinion [...] would only count if we accepted [the project] with compensation [...] If we opposed or were against it, they were going to completely ignore us because we were of no interest to them" (cited in Dunlap and Riquito, 2023, p.11). Since 2018, when Unidos em Defesa de Covas do Barroso formed at the forefront of the local anti-mining movement, the reaction of Savannah, instead of promoting substantial community engagement, has been to neutralise dissent (ibid). In a comprehensive public relations campaign, it addressed contestation of the project as a result of "misunderstandings", "lack of information", or a lack of reasonableness on the part of residents, isolating the organised "opposition" as a few radicals, untrustworthy and a hindrance to green progress. In reality, it is also important to emphasise how the Barroso's local resistance movement was able to coalesce and form alternative support networks that include national and transnational non-governmental actors with experience of navigating the contested legal space between extraction companies, civil society and the state. These include Portuguese NGOs with UN consultancy status (ZERO and QUERCUS); local and national environmental and community resistance movements (Associação Unidos em Defesa de Covas do Barroso; Mining Watch Portugal; Observatório dos Recursos Naturais) and international NGOs (Iberian Mining Observatory; Montescola Foundation).

"Soft technologies of social pacification" have also been deployed, such as "making social development promises, organising local support, employing public relations campaigns, utilising scientific research to legitimise their claims, employing environmentally friendly rhetoric, and developing infrastructures to support its operation" (Dunlap and Riquito, 2023, p.16). These have increased since the approval of the DIA, in May 2023.

Cooperation between the mining company and state authorities in preventing public participation, weakening dissent and allowing the mine project to proceed in the face of widespread public outcry, has resulted in multiple injustices and psychological and emotional impacts on the local community (Riquito, 2025). This applies especially to women, who are often on the frontlines of the struggle and, due to their historical role in social reproduction, often assume a lot of the emotional labour needed for resistance (Riquito, webinar, 2025). One resident stated: "We're in a very painful, difficult, unfair, exhausting process, but we keep fighting"; and continued: "People are not just tired but outraged [...] We always thought the state was here to defend us, not to stab us in the back and defend private interests" (GreenPaths CES seminar, 2025). Another referred to the National Republican Guard's policing practices as forms of "intimidation" against local protesters. As Riquito notes, "extractivism's most profound impact [...] is the emotional, the affective, created by the presence of mining companies and their instigations of divisions and manipulations, and the halt that it puts on the possibility of a future" (Riquito, webinar, 2025).

Main results

The EU's green transition creates severe socio-environmental costs for rural communities like the one of Covas do Barroso. Policies justify "green extractivism" by sidelining democratic and environmental safeguards, creating sacrificial logics that disproportionately burden peripheral regions. The primary enabling mechanism is a policy framework - spearheaded by the EU's CRMA and Portugal's PNEC - that construct a narrative of manufactured urgency based on geopolitics, economic competitiveness and nationalistic pride, couched alongside climate goals. This narrative fast-tracks extraction by designating projects like Mina do Barroso as "strategic", allowing them to bypass environmental protections and substantive public consultation. These policies employ deliberately ambiguous language, offering hollow commitments to

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environmental sustainability and a narrowly defined Just Transition (PNEC) that exclusively focuses on urban energy poverty whilst omitting rural communities affected by extraction.

Proponents frame the project through a discourse of "rural decline," presenting the mine as the only solution to depopulation and underdevelopment. Instead, locals affirm the mine will threaten their way of life, rooted in small-scale agriculture, traditional husbandry - practices that depend on and care for a healthy ecosystem. Existing practices are defined as "truly sustainable," opposing an extractive vision that equates life's value with metrics of economic growth. Locals denounce the legally contested land grabbing and anticipate the irreversible destruction of intangible values, from health and wellbeing to their cultural identity and GIAHS status, as well as the disruption of livelihoods, leading to further emigration.

These social costs are inextricably linked to profound environmental costs. Treating them as separate reinstates the Western modern-colonial dualism of "human vs. nature", which is largely contested by environmental justice, ecofeminist and political ecology scholars (see Swyngedouw, 2007; Martínez-Alier, 2002; Latour, 1993; Merchant, 1980). The open-pit mine threatens widespread pollution, soil degradation, and catastrophic contamination of water resources vital for local subsistence and socio-ecological reproduction. It poses an irreversible threat to biodiversity, including endangered species. These harms are naturalised by a techno-solutionist discourse promising mitigation and restoration. The company and state authorities pre-emptively declare future environmental harm null and void through promises of technological repair, a logic enabled by EU regulation. However, expert analysis and local knowledge confirm that mitigation plans are inadequate, highly experimental for water management, and cannot compensate for the project's fundamental destructiveness.

Ultimately, fast tracking and the denial of these costs lead directly to the sacrifice of community participation. The study reports multiple violations of the Aarhus Convention, including inadequate public consultation and restricted access to information (ACCC/C/2021/186, 22 August 2025). The erasure of dissent has been a priority for Savannah Resources. This has generated significant psychological and emotional impacts, particularly for women on the frontlines, fostering feelings of exhaustion, outrage, and betrayal by a state perceived to be defending private interests over those of its citizens. The Barroso case stands as a stark emblem of how green transition policies, in practice, perpetuate sacrificial logics of dispossession and marginalisation. These logics concretise into procedural, recognitional, distributional, and prospective injustices, resulting in the creation of green sacrifice zones within Europe itself - particularly in rural areas - all in the name of promised national or supranational (economic) benefits.

Discussion and conclusions

The costs and benefits of 'green' transition policies, when analysed through the lens of GSZs, reveal some key sacrificial logics and narrative devices that fail to correspond with the lived realities of local communities. Furthermore, the aims seem contradictory: mining lithium to reduce carbon emissions requires damaging the environment to save the environment – this paradox needs to be challenged as the policy drive cascades from the global to the local, where representation and power dynamics in decision-making processes, self-determination in, access to, and use of resources, and who benefits financially need to be intensely scrutinised.

Over the past decade, the concept of GSZs has been extensively studied in the Global South, particularly in the Lithium Triangle, highlighting the resistance of local, often Indigenous, communities to the extractivist and colonial dynamics of the green transition (Balcázar Morales,

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Webinar, 2025; Voskoboynik and Andreucci, 2021). These dynamics are linked not only to the pervasive socio-ecological impacts of such projects but also to their perpetuation of "patterns of dispossession, marginalisation, and selective exposure to harm—dynamics that resonate with the original formulation of necropolitics" (Brandajs, 2025, p.4; Debert and Le Billon, 2024). While "green" mining is already a reality in Europe, it frequently exists in the form of contested projects processes, not fully realised plans. Indeed, literature on the making of green sacrifice zones within the EU has grown in recent years, highlighting the particular risk of their emergence in European peripheries (Djukanovic, webinar, 2025).

The lithium rush in Portugal, exemplified by the proposed Mina do Barroso project, is a key case in point. This study has contributed to this literature as well as to GreenPaths' overarching aims by elucidating the sacrificial logics characterising the projected lithium mine in the Barroso region. Preceding and paving the way for the material act of extraction, these logics—embedded in policy documents and mining advocates' discourses, and unmasked by residents and anti-mining stakeholders—reveal ongoing and anticipatory processes of (procedural, recognitional, and prospective) injustice, alongside entrenched inequalities (especially rural/urban and gendered), and multifaceted socio-environmental-economic-psychological losses and damages.

While closely resonating with the 'conventional' (i.e., fossil fuel) sacrifice logics described by Reinert (2018), the sacrificial dynamics in Barroso exhibit key differences specific to both its 'green' rhetoric (cf. Voskoboynik and Andreucci, 2021) and the current geopolitical moment. Whereas, until recently, 'green' extractive projects underwent lengthy evaluation processes (Pusceddu, 2024, p.391), often due to continual EIA referrals and strict EU environmental policies, our CDA reveals a new language of "urgency" and "fast-tracking" in the CRMA. This rhetoric, often driven more by geopolitical competitiveness and military defence than climate action, suggests a future acceleration of Strategic Project approvals, which effectively prioritises mineral extraction at the expense of environmental protections, local community interests and the principles of a JT.

As evidenced by CDA of the PNEC (2024), the concept of a JT risks becoming an increasingly empty signifier, used to justify green capitalism rather than to combat or prevent the multiple, intersectional forms of injustice experienced by vulnerable groups, industrial and non-industrial (care) workers, and communities affected by decarbonisation policies—the latter being notably absent from the plan. While the PNEC mentions JT multiple times, it simultaneously presents the green economy and green extractivism as unequivocal opportunities for national standing and economic growth, promoting a win-all green development narrative. Moreover, the 2023 PNEC is the first Portuguese Plan to dedicate a specific section to critical raw materials extraction, clearly influenced by the EU's CRM strategy. As in the CRMA, a clear inconsistency exists between the deployment of a vague notion of "sustainability" and a lack of any tangible improvements in environmental protection. Furthermore, opaque references to "respect for human rights and labour rights, including the community life of indigenous peoples" (CRMA, Annex 1V, 2024) fail to cross-reference any specific, substantive and binding legal instruments under international human rights law (IHRL). For example, given the importance of water in the Barroso case, linked to the aforementioned foundational treaties of IHRL, the 2010 recognition of a distinct human right to water (UN Res. 64/292), further clarified by a 2015 de-coupling of water and sanitation as linked, but independent rights (UN GA Res. 70/169), could have been cross-referenced with regard to rights to protection and recourse for possible contamination of drinking water. Alternatively, UNDROP Articles 5.1 and 28 relate to peasants' and rural workers' rights to access, sustainably use and co-manage their communities' natural resources. As Boyd

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(A/HRC/52/33/Add.1, 2023) argues, “large resource extraction projects that may violate human rights in the name of the green transition are antithetical to sustainable development”, highlighting that the “growing global problem of sacrifice zones” is "incompatible with the human right to a healthy and ecologically balanced environment” (ibid). Efforts to reconcile green mining with meaningful conservation thus appear increasingly unrealistic.

Extractivist projects frequently employ a “rural decline” discourse to justify mining in the name of development and its attendant socio-environmental harms (Carballo-Cruz and Cerejeira 2020; Del Mármol and Vaccaro, 2020; Velicu, 2019; Saleth and Varov, 2023). As De Mármol and Vaccaro (2020) have shown, this remains true for green extractivism in the EU, which is predicated on a renewed colonisation of rural areas strategically framed as “empty”. The lithium projects in Barroso confirm this trend (Dunlop and Riquito, 2023; Pusceddu, 2022), enacted through a specific sacrificial logic: lithium advocates' strategy of addressing the area as underdeveloped, depopulated, almost dying – thereby overlooking Barroso’s existing socio-economic-ecological fabric – has the effect of pre-emptively erasing the very possibility of sacrifice, which in turn may enable it. This analysis demonstrates that the company is not asking the community to endure a socioeconomic loss for a greater good; rather, it denies any socioeconomic costs, presenting only benefits that scale from the local (jobs, financial incentives) to the national (prestige, growth), the EU (geopolitical competitiveness), and the planetary (combating climate change). This monolithic discourse precludes a public debate on whether and what kind of sacrifice the community is willing to endure, or what trade-offs they are prepared to make, thereby framing community dissent as an exceptional, extraneous and residual act to be neutralised.

Conversely, the community’s response, shows that green extractivism reproduces and intensifies existing inequalities - especially between urban and rural areas and those based on gender - and enacts distributional, procedural, and recognitional forms of socio-environmental injustice. Particularly relevant to the Barroso case is what Velicu (2020; Velicu and Kaika, 2017) terms “prospective injustice”, a concept describing how extractivist projects can create socio-environmental harm even in the proposal phase, long before they become a material reality. As seen in Covas do Barroso, this pre-emptive harm manifests in ongoing processes such as land grabbing, intimidation, psychological distress, community marginalisation and the systemic discrediting of local residents as "irrational" political subjects (Velicu and Kaika, 2017), which denies their oppositional agency and right to decide on their own territory. It also manifests in the local community’s anticipation of future losses linked to the erosion of their material livelihoods. As Rodriguez-Fernandez (2020, p.34) explains, extractivism is generally not labour-intensive but resource-intensive: it creates, and depends on, “the absence of [local communities’] social reproduction”. This dynamic emerges also in the Barroso case: promises of future jobs are generally discredited by residents who point to the Mina do Barroso’s need for hyper-qualified workers and expectation of short-term contracts that Savannah will eventually offer. Instead, what they underline is that the lithium mining infrastructure will depend, in order to function, on extracting, consuming and polluting natural resources and damaging ecosystems, which will directly affect people's - especially farmers’ - long-term subsistence and survival. It is not by chance that women - historically assigned to reproductive labour - are on the frontlines of the Barroso anti-mining struggle. And yet, more research is needed to expand on the gendered impact of the Mina do Barroso project (Venes et al, 2023) and of green extractivism more generally.

Another specificity of GSZs highlighted by this case is the strategical use of “restoration”. This discursive strategy represents a significant evolution from traditional sacrificial logics. Where

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fossil extractivism often acknowledged environmental harm as a visible and permanent cost (compensated by the promise of jobs and economic prosperity), green extractivism relies on techno-solutionist promises of future restoration and 'no net loss' to render the sacrifice invisible and temporary. The violence of extraction is framed not as a lasting trade-off but as a short-term disruption to be expertly repaired, thus protecting the industry's sustainable and ethical credentials. This logic is more insidious as it demands faith in a future solution rather than acceptance of a permanent loss, disarming present opposition. It is essential for protecting the "green" brand of such projects, shifting the debate from the ethical and political question of "Should we allow this permanent harm?" to the technical negotiation of "Are these restoration plans adequate?"—a terrain far more favourable to corporate interests. Moreover, as Fabiana Li (2015) argues, mining corporations and government agencies often create "equivalences" by converting varied environmental and social issues into uniform technical measurements. This act of commensuration tends to depoliticize disputes, making complex social and ecological realities appear manageable within technical and bureaucratic systems.

In summary, the "restoration discourse" is a defining feature of "green" sacrifice—a novel mechanism that enables destruction to proceed under the guise of sustainability by promising to make the sacrifice disappear. This aligns with Brock's (2020) concept of "accumulation by restoration," which refers not only to profit but to the productive and legitimising power of restoration work. As she argues in the case of RWE's coal mining, such activities manufacture legitimacy, create new "ecologies of repair," capture imaginations through narratives of sustainable extraction, and effectively pre-empt dissent, all while producing and obscuring associated harms (Brock, 2020, p. 2134). Yet, the present study does not argue against restoration or mitigation strategies as necessary remedies for environmental injustice and as communities' tools of resistance; rather, it critiques how its discourse is instrumentalised by corporations and governments to neutralise dissent, facilitate approval, and pre-emptively annul the concept of sacrifice itself.

Overall, the Barroso case reveals a profound dissonance between the multi-scalar benefits promised by green transition advocates and the localised realities experienced by communities. Despite being denied the "right to say no" and subjected to psychological violence or emotional extractivism that attempt to weaken their resistance (Riquito, webinar, 2025), local residents, activists, and NGOs play a crucial role in identifying 'green mining' as another frontier of capitalist extraction where the primary beneficiaries are the State, mining corporations, and private investors—not vulnerable communities. Current green transition policies are central to the making of Barroso's green sacrifice zone. Their impacts—both costs and benefits—are channelled to local populations through the downstream integration of 'green' targets, incentivised by promises of economic empowerment, (geo)political relevance, and planetary salvation. However, the collective support, Just Transition strategies, and socio-ecological benefits implied by the CRMA and PNEC are neither clearly articulated nor readily quantifiable.

Through this case study, we applied the GreenPaths analytical framework to ground the social impacts of green transition policy through lenses of (green) sacrifice and (environmental) injustice to document how the multifaceted ripple effects of a proposed lithium mining accelerate through administrative hurdles based on positivist affirmations and short-term promises of 'jam tomorrow,' whilst community concerns, alternative visions and questions about the long-term sustainability of the region are framed as uninformed or dissenting.

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Data remains critically limited. We contextualise the Barroso case with indicators on jobs in renewable energy, regional socioeconomic inequality (risk of poverty and social exclusion), and lithium production. However, these are merely benchmarks; any robust assessment of socioeconomic impacts must be longitudinal. With Savannah's project set to commence operations in 2027 and the next Portuguese census not due until 2031, significant information gaps persist. At the same time, Goodhart's Law (1975) cautions against the tendency for measures to become targets; within such logic, indicators can inhabit an "'accounting culture' in which tests of measurability often prevail over accurate and contextually sensitive assessments of substance or actions" (Rosga and Satterthwaite, 2009, p.256). In the Barroso case, this relates to a lack of detailed regional household surveys, disaggregated sociodemographic data, and—crucially—indicators of intangible loss and damage, which are essential for an intersectional analysis of the transition's true costs and benefits. The methodological tools applied in this study (CDA, the CRMA, the PNEC and the EJ framework) provide a way of peeling back the layers of certainty that permeate the drive and discourse for green mining, whilst the further conceptualisation of GSZs in this context unveils a deeply embedded layering of sacrificial logics that serve to separate a community from their (socio-enviro-economic) resources.

Moreover, "lithium for renewables" is being replaced with "lithium for war" rhetoric, as the Green Deal policy drive is being supplanted by calls for EU defence and remilitarisation. Within this context, imagining policies for a truly Just and Green Transition becomes crucial. This requires centring community participation and self-determination in decisions regarding socioeconomic development and land use. It must prioritise the protection of incommensurable, often non-economic and irreplaceable, place-based values, and formally acknowledge all forms of loss and damage. Furthermore, a policy vision as ambitious in scope as the EGD should not, by proxy, facilitate violations of due process, downgrade public participation and risk irreparable environmental harms in the name of short-term projects with planned obsolescence, such as Mina do Barroso. The Barroso case underscores the urgent need for open, transparent, and community-led discursive spaces to debate alternatives to the monolithic narrative of green extractivism, particularly in the face of top-down, *fait accompli* policy implementation.

Recommendations

The findings demonstrate that a policy framework built on narratives of urgency, geopolitical competition and techno-solutionism systematically sidelines democracy, dismisses socio-ecological costs and naturalises future harms. To align the green transition with principles of justice and sustainability, the following recommendations are proposed:

1. Radically expand the scope of Just Transition' frameworks. Current policies, such as Portugal's PNEC, narrowly define a Just Transition around urban energy poverty and retraining for fossil fuel workers. This must be expanded to explicitly include and address the intersectional inequalities aggravated by green extractive projects and to guarantee socio-environmental justice (SEJ). This means:

    - Formally recognising the earth-care labour and value of existing rural livelihoods (small-scale agriculture, traditional pastoralism, eco-tourism), cultural heritage (GIAHS status), and the ecological place-based knowledge of local communities, not merely to be compensated for loss, but as sustainable models to be protected and integrated into transition planning.

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- Developing legal and policy tools to recognise, anticipate and mitigate the socio-environmental injustices that begin the moment a project is proposed, including the intangible Loss and Damage as well as Environmental Distress, social fragmentation, land-use changes, and uncertainty experienced by affected communities.

2. Guarantee substantive democratic participation and the "right to say no". The violations of the Aarhus Convention in Barroso reveal a democratic deficit. Policies must move beyond superficial consultations to ensure meaningful procedural justice:

- Guarantee free, prior, and informed consent (FPIC) processes that are inclusive and representative. This requires going beyond consulting a few community leaders to explicitly ensure the participation of women, youth, Indigenous Peoples, and other marginalised groups. The process must guarantee that the community's right to refuse a project is legally recognised and feasible, reflecting the collective will of all its parts, building on existing legal and policy frameworks, like UNDROP (2018), the Voluntary Guidelines on the Tenure of Land Fisheries and Forests in the Context of National Food Security (2012) and The Warsaw International Mechanism for Loss and Damage associated with climate change impacts (2015).
- Legally empower municipal authorities and community representatives in decision-making, making their opinions binding not just advisory.
- Ensure in advance full transparency and accessible dissemination of all the project's information (EIAs, feasibility studies) in non-technical languages.

3. Dismantle sacrificial logics by changing policy and expanding indicators:
   - Remove the "overriding public interest" clause: change the CRMA and related regulations to prevent projects from automatically bypassing protected area status.
   - Establish criteria of "no-go zones" for mining, such as Natura 2000 areas and GIAHS.
   - Develop a comprehensive set of indicators: include longitudinal indicators for Intangible Loss and Damage, community well-being, public (mental) health, and human/ecosystem health. This requires independent – detailed and disaggregated – regional surveys and participatory processes to capture the intersectional and prospective costs of transition project.

4. Reject techno-solutionist neutralisation of harm. The promise of future mitigation and restoration must not be used to pre-emptively justify destruction. Policies must:
Prioritise the avoidance of harm over its future repair.

- Legally acknowledge that certain losses - such as cultural identity, ancestral land, and unique ecosystems - are irreversible and cannot be compensated by technological fixes or financial payments.
- Involve a significant financial and legal penalty for failures to adhere to environmental law.
- Grounded in degrowth principles, enact policies based on sufficiency and circularity, such as mandatory recycling targets and product design standards that extend lifespans, to lessen dependency on new mining.

In conclusion, the Mina do Barroso case is not an anomaly but a sign of further conflicts to come under the current green transition paradigm. The path forward needs a fundamental shift from a logic of growth, extraction and sacrifice to one of degrowth, care, democracy, and justice. This

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entails centring the voices and needs of front-line communities, redefining “green” policy not by its speed, but by its fairness, and guaranteeing that the transition to a low-carbon future does not replicate the very patterns of dispossession, marginalisation and inequality it says to solve in the name of sustainability.

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1.2 Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania

Overview

This case study investigates the social impacts of EU and national nature conservation and forest restoration policies in Romania, focusing on the controversial forest land purchases by the Foundation Conservation Carpathia (FCC) in the Făgăraș Mountains. This area, a 200,000-hectare biodiversity site in the Carpathians and the largest virgin forest area in Romania - the majority of which has been part of the Natura 2000 network since 2007 - contains significant populations of protected species and serves as a crucial reservoir of clean water for millions of people. Here, the FCC aims to create the most ambitious private conservation project in Europe: a private wilderness reserve marketed as "Europe's Yellowstone". The ecopark project directly affects 73,000 inhabitants living in 128 localities surrounding the mountain (Ministry of Environment, Waters and Forests, 2016).

Founded in 2009 by German ecologist and conservationist Cristoph Promberger, the private Foundation is a central actor implementing the European Green Deal (EGD) in Romania by restoring degraded ecosystems and rewilding Carpathian forests. Their strategic plan, launched in 2009 and supported by a Romanian Government memorandum in 2016, targets the protection of the area and promises sustainable development for local communities through eco-tourism and organic agriculture. So far, the foundation has purchased over 28,000 hectares (FCC, 2024) and its activities include reforestations, the rewilding of emblematic species (80 bison, 42 beavers, 110,000 trout), biodiversity monitoring, as well as measures to reduce human-wildlife conflicts through electric fences and compensation for damages (Ibid).

The role of the FCC must be understood within the contentious context of Romania's post-socialist forest restitution process, which unfolded in several legislative stages (1991, 2000, 2005) and was marked by corruption, clientelism and legal ambiguities (Sikoret al., 2009). This period facilitated a "timber rush" (Vasile, 2022), which saw thousands of cases of illegal restitutions and aggressive exploitation by new owners, which in turn triggered a powerful policy backlash. Romania's 2008 New Forest Code, sought to combat illegal logging, "unleashed new patterns of oversight, stricter controls and criminalisation of forest wrongdoers" (Vasile, 2022). This intense conservation turn created a political climate where, "the entire field of forestry seemed to be shrinking under the pressure of tight laws" (ibid). This domestic context dovetails with the launch of the EGD, whose Biodiversity Strategy 2030 and Regulation on land use, land-use change, and forestry (LULUCF) set ambitious targets for protecting old-growth forests and carbon sinks, with the EU's Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012) certification creating a framework for voluntary carbon credit markets. These EU directives directly inform Romanian policy, legitimising the strict protection model invoked by the FCC, which has positioned itself as a central actor in implementing the EGD through rewilding, promoting ecotourism, and launching pioneering projects like the Carpathia Carbon Finance Project.

The research uses the "Europe's Yellowstone" project as a lens to explore how these macro-level changes in forest governance impact communities' dependency on forest resources. It specifically examines issues of vulnerability, power dynamics and socioeconomic impacts on small-scale agriculture, forestry, animal husbandry and common lands (composesorate and obști), alongside the criminalisation of local practices and threats to the rural social fabric. The study builds upon existing analysis by scholars like George Iordăchescu (2018, 2021a, 2021b), who has highlighted

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the FCC's role in “green grabbing” and "fortress conservation" and Vasile's work on the conflicts of forestry policy (2022; Iordăchescu and Vasile, 2023). Empirically, it offers new contributions by cross-analysing media, legal, and policy documents with a substantial number of interviews from diverse local stakeholders. Theoretically, it puts Environmental Justice studies on Green Sacrifice Zones (GSZs) into dialogue with the empirical findings from the Carpathians to understand the conflicts and injustices that can arise from top-down sustainability transitions and the implementation of grand environmental policies like the EGD. We foreground the case with the following statistics that provide a national context to the case study: 12.5% of Romanians cannot heat their homes adequately (EU-SILC/JRC, 2023); rural poverty risk is 41.7% (Eurostat, 2024); 18% of the population work in agriculture (ILO, 2023).

While existing studies have predominantly focused on the historical emergence and trans-local praxis of the FCC conservation model, this case study observes the same phenomenon through the lens of GSZs, thus contextualising it within recent EU green transition policies and shedding light on the multiple forms of environmental injustice suffered by local communities in the Făgăraș Mountains. In this sense, it makes a distinct contribution by applying the critical lens of GSZs to biodiversity conservation. While this concept has typically analysed the damages of “green extractivism”, we demonstrate that a similar sacrificial logic—concentrating socio-ecological costs in a specific locality for a purported environmental good—is operative in the EU's flagship forest conservation policies. In this sense, we build on the logic of Ipsen and Lequieu (2024, p. 532) who state that the concept applies “to a specific geographic location where socioecological life is rendered dispensable by and for those with relatively more power than those impacted”.

Research questions

Following GreenPaths overarching research questions, this case asks: How do forest conservation policies impact rural communities in Romania? What are the policies that favour forest conservation in Romania? Who are the winners and losers of these changes? What are the anticipated costs and benefits of Europe’s Yellowstone? How is civil society participating in the promotion or critique of such changes? Who are the key actors and how are they responding (e.g. institutional/policy; local/community; external actors)?

In order to answer these questions, this study employs the concept of “green sacrifice zones” (GSZs) (Brandajs, 2025; Scott and Smith, 2017; Zografos, 2022; Zografos and Robbins, 2020;) to analyse the socio-ecological impacts of green transition policy—especially biodiversity and forest conservation policies—as experienced and portrayed by different stakeholders in the region. Drawing on Environmental Justice and Political Ecology literature, the concept of GSZs emerged in the wake of recent (US and EU) Green Deal proposals and transition agendas to expand the idea of conventional “sacrifice zones” (Juskus, 2023), to “include places and populations that will be affected by the sourcing, transportation, installation, and operation of solutions for powering low-carbon transitions, as well as end-of-life treatment of related material waste” (Zografos and Robbins, 2020, p.543).

Where GSZs are largely associated with “green extractivism” and socio-ecological damages, injustices and losses linked to green mining and the extraction of renewable resources (Dunlap et al., 2024), the gap in research this case study investigates is the concept of GSZs in environmental or biodiversity conservation projects. Conservation is more commonly mobilised as an oppositional framework to extractivism and is associated with potential solutions to the environmental harms and the sacrifice of socio-ecological well-being caused by extractive infrastructures. Whilst this may seem counter-intuitive, as Le Billon affirms (2021, p.879),

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throughout the past three decades affinities between extraction and conservation have been growing; they go "beyond opportunistic funding and green-washing", demonstrating "readiness to dispossess in the name of a 'greater cause', whether through de-humanised understandings of biodiversity or false promises of economic development. While potentially progressive, the agenda pursued by the conservation-extraction nexus is at risk of facilitating the opening up of lands to large-scale extraction, while closing others to traditional livelihoods and communities".

The case study adds to understanding of a key dichotomy in the Anthropocene conservation debate that is reflected in green transition policy: between a 'neoprotectionist' approach that argues for ring-fenced conservation areas that separate humans and purify nature and a 'new conservation approach' that centres a sustainable interdependence of human and non-human nature (Buscher and Fletcher, 2020). Within the first approach, our study investigates the impacts of 'fortress conservation' and the emergence of new forest feudalism in the Romanian forest policy context, whilst in the second realm, our research is inspired by 'convivial conservation' frameworks (Buscher and Fletcher, 2020; Iordăchescu, 2022) to explore post-capitalist concepts of conservation that seek to build on and protect both the natural environment and the historical, sustainable, silvicultural practices of local populations, thereby challenging recognitional and distributional injustices in the commodification of nature for profit. As Iordachescu (Webinar, 2025), argues, the depiction of virgin forests and research sanctuaries in the Carpathian Mountains is built on mythologies of nature purification and erasure of the historical footprint of the local population.

We apply our research questions and mobilises the GSZ analytical perspective for addressing the European Yellowstone mega-conservation project for three main reasons: 1) the concept emerged from current EGD and green transition policies, making it a tool to diagnose the national and local consequences of this policy framework; 2) it aims to critically analyse "green" rhetoric and practices, the multiple forms of socio-environmental injustices suffered by human and non-human agents in specific affected areas; and 3) it highlights alternative (inclusive, democratic, decolonial, bottom-up, place-based) knowledge and practices of eco-social transformation that emerge from the resistance of local communities. Understanding GSZ as "sites of concentrated environmental injustice" (Juskus, 2020), this case analyses the multiple forms of environmental injustices (procedural, distributional, and recognitional) in place in conservation areas and natural parks such as the Romanian Yellowstone, especially in the Făgăraș Mountains.

Methods

This mixed-methods study combines the analysis of specialised literature, media analysis and the analysis of the legislative and public policy framework, with primary data obtained from 14 interviews with local residents (forest owners, foresters, business owners) living near the forests owned by FCC in the Făgăraș Mountains, former forestry/forest administration/FCC employees and locals in civic leadership roles (president of Nostra Silva, leader of forest commons, local municipal officials) , as well as the testimonies of FCC representatives during public events and meeting in Romania, held in 2019, 2023, and 2025. Content analysis on media reporting was conducted on how the projects of the FCC were reflected in the national, international and local press. Analysis of the data identified two main overarching tones identified in the exposure of the green transition in Romanian mass media: triumphalist and critical-investigative. The media analysis targeted a corpus of 70 articles and reports about Conservation Carpathia, published between 2014 and 2025. The materials were selected from the national press (Adevărul, Libertatea, Digi24, România TV, Antena 3, ProTV etc.), the local press (Monitorul de Făgăraș, Jurnalul de Argeș), and the international press (The Guardian, El País, National Geographic, New York Times etc.). In total, 35 articles from the national press, 20 from the local press, and 15 from

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the international press were included. We also analysed three video and audio recordings from "public debates" organised by FCC with local authorities.

The primary research in the Făgăraș-Rucăr-Lerești-Nucșoara area was carried out during two field trips, in March and July 2025. During this period, 14 semi-structured interviews were conducted with a diversity of local actors: two mayors (male), three communal leaders (obști presidents: two female and one male), four forest owners (two female and two male), one former FCC employee (male), one tourism entrepreneur (male), two foresters and one leader of a forest owners' organization (male). Selective sampling targeted individuals according to their relevance to the forests, small-scale forest industry, conservation and their interactions with FCC projects and lands FCC.

An interview script was developed and refined with questions designed to align with specific dimensions of environmental justice (distributional, procedural, recognitional), grouped around themes that relate to processes of social impact: land-identity, recognition, skills, capabilities; difficulties/ losses; perceptions of fairness/justice, distribution of benefits, social trust; civic/political participation, belonging to a community/association. All participants were informed about the purpose and methods of the research and signed consent forms. The interviews were coded and analysed using Excel and MAXQDA software, based on a thematic framework structured into four major dimensions: identity and relationship with the land; difficulties and losses; perceptions of justice and benefit distribution; civic and political participation; as well as perception of the press and the fairness of media coverage of environmental issues.

Drawing from the GreenPaths analytical framework, the social impacts the case investigates include injustice and inequality, Loss and Damage, governance/policies and labour. The core concepts of the case include sustainable growth, decarbonisation and green grabbing. The case study identifies dimensions of socioenvironmental justice most commonly referenced in association with a green or just transition (distributional, procedural and recognitional) (see GreenPaths report D1.2 for summary and bibliography). The GSZs lens—previously used to examine injustices and harms caused by green extractivism—is deployed here to assess whether current EGD and Romanian conservation policies, while claiming to protect the forests from humans, are in fact perpetuating the sacrifice, marginalisation, and dispossession of rural communities whose subsistence directly depends on that very environment.

Findings and results

The EGD and the Carpathian Conservation Project

EU policy, particularly the EGD, has been a key driver for biodiversity conservation through a neo-protectionist approach based on "strict separation of an allegedly wild nature" from traditional land uses (Iordachescu, 2022, p. 159). The EGD's Biodiversity Strategy for 2030 introduces clear targets of 30% protected areas, 10% strictly protected areas, and the full protection of old-growth forests, creating new conservation pressures in regions such as the Carpathians (Iordăchescu, 2022). This marks a paradigm shift from earlier strategies by setting fixed quantitative objectives. Moreover, to achieve climate neutrality by 2050, the EU Carbon Removals and Carbon Farming Regulation (2024) establishes a voluntary EU-wide certification mechanism for carbon removal and capture, which includes afforestation and sustainable forest management. However, as Bogovegic (2024, p. 208) recognises in the carbon farming context, there remain "major legal questions concerning the motivation, construction, operation and public engagement relating to carbon removals". These EU directives directly inform Romanian policy.

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The Integrated National Energy and Climate Plan (INECP, 2024) consolidates climate adaptation strategies and reaffirms that "Romania's energy ambitions are indivisibly linked with the EU's broader energy and climate policy objectives". Similarly, the Romanian National Strategy for Forests 2030 aligns with the EGD, aiming to expand protected forests and combat illegal logging under the New Forestry Code (2024). Romania currently reports 23-25% of its territory as protected areas but less than 1% is strictly protected, and it is legally required to identify mechanisms to reach the 30%/10% EU thresholds by 2030.

The government supports the FCC's initiatives as a way to demonstrate to the European Commission that Romania is delivering on these European biodiversity protection standards. These new EU conservation and climate policies have thus legitimised the strict protection model invoked by the FCC in the Carpathians. In the FCC's discourse, and in capitalist conservation more generally (Vesalon and Anghel, 2024), ecological catastrophe is presented as justification for private conservation interventions as the "only solution" to environmental degradation and land abandonment (Iordachescu, 2021; Swyngedouw, 2010). Their philosophy is outlined by former board member Erika Stanciu: "Romania is a rich country, and we have the chance to put these riches on the market in a sustainable way, for a better life. We want an alternative development that does not involve senseless logging or unnecessary investments, but the capitalisation of what we have, to become the most beautiful country in Europe and to earn money from it" (Nostra Silva, 2019).

The FCC secured major EU funding in 2019 for the €27.6 million LIFE project for wilderness creation and ecotourism, which supports local producers via initiatives like the "Roadele Munților" Food Hub. Beyond large grants, FCC has created its own Carpathia Fund / Small Grants Programme, committing over €1 million to local businesses and community initiatives. Furthermore, the Foundation is launching pioneering projects like the Carpathia Carbon Finance Project. This project has been registered under Verra's Verified Carbon Standard (VCS) - the world's leading standard-setter for voluntary carbon credit markets - and positions FCC to compete in the future voluntary carbon credit market established by the EU CRCF. The third-party verification processes for carbon certificates under the new EC policy are yet to be confirmed, but they could incorporate already established, independent verification standards (i.e. Verra's VCS to fulfil (at least part) of the criteria as an 'EU recognised scheme'). There is recognition that the EU needs to "develop tailored certification methodologies for different types of carbon removal activities" (Bogojevic, 2024). Even without this added value, the FCC's annual budget exceeded 13 million euros by 2024, with its funding split as follows: Private Entities and Foundations (40%), other private sources such as individuals and corporations (45%), and Public Funds (10%) (FFC, 2024). The transposition into national legislation of the Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC) allows the active involvement of NGOs in the monitoring and management of Natura 2000 sites. Foreign tourists are especially appreciated because they are willing to pay 250 euros per night for a guided tour. According to one former FCC employee: "Our role was to lead them to the animal observatories and to explain to them the purpose of the project, namely the protection of flora and fauna, and to explain how the restoration of areas affected by these clearcuttings is carried out" (Interview 8).

The FCC uses multiple financial vehicles and registered commercial companies to manage land acquisitions, tourism activities, and related operations. This structure allows it to attract capital, supplementing donations and grants with revenues from the commercial exploitation of assets. FCC is financially supported by a transnational network of philanthropists and international institutions. Among the funders are the Wyss Foundation, UBS Optimus Foundation, ING Bank, as well as conservation organisations like Frankfurt Zoological Society-US (FCC, 2023). Moreover, in Romania, the foundation benefits from the support from prominent environmental NGOs like the WWF, Greenpeace, ProPark-Foundation for Protected Areas, as well as the Natura

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2000 network, and has cultivated partnerships with biodiversity specialists, such as the Romanian Ornithological Society. Such alliances illustrate what Holmes (2012) describes as "philanthrocapitalism", whereby conservation and philanthropy intertwine with capitalist logics, offering both legitimacy to economic actors and new market opportunities for the expansion of capital. As Vesalon and Anghel (2024) demonstrate, this model relies on alliances between global NGOs, philanthropists and private capital, as well as on favourable media attention. Indeed, mass media, has played an important role in portraying FCC as a win-all project for environment, the economy, investors, the government and local communities.

In our analysis we observed that in the mass media, the project is reflected positively, even enthusiastically in 70% of cases. Ever since a 2011 campaign organised with WWF and Greenpeace to denounce illegal logging and Romania's loss of forest, the mass media started portraying forests as victims, activists and journalists as heroes and local communities as offenders (Vasile and Iordăchescu, 2022), legitimising FCC's continued acquisition of lands and disseminating their philanthrocapitalist philosophy. In 2023, The Guardian described the FCC plan as "a Yellowstone for Europe" emphasising the spectacular biodiversity and the reintroduction of bison as "a historic success" (Dunford, 2023), while El País reported with an epic tone in 2024: "People in the villages thought we had found gold or uranium. They could not imagine that we would invest so much money just to protect nature" (Costa, 2024). This triumphalist tone is reflected nationally, for example, Libertatea headlined as early as 2018: "Foreigners who are reforesting our country because we have something unique" (Ionașc, 2018), presenting the massive forest acquisitions as an act of visionary philanthropy. Only 30% of the articles offer a critical-investigative approach, which predominantly in the local press, documenting community discontent and accusations regarding the way forests were acquired. Nationally, in 2016, the Antena 3 investigation, "Premeditated Heist" documented illegal restitutions, clearcutting and reselling of lands to FCC, raising the question of whether European funds were indirectly financing deforestation (Puiulet, 2014). Other local articles use strongly dramatic headlines, such as "The Yellowstone Business: The Forests of the Făgăraș Mountains in the Hands of the World's Rich. The Conservation Carpathia Foundation Does Not Give Up" (Monitorfg.ro, 2019), suggesting a grabbing of resources by global actors. Monitorul de Făgăraș consistently published articles with a similar tone: a piece from 2019 headlined that FCC operates as "a parallel authority" with power over waters, pastures and forests, whilst more recently, a 2024 article titled "The Făgăraș Mountains Are Not for Sale" reflects the ongoing opposition of forest owners.

An FCC-funded socio-economic assessment report (Ungureanu and Promberger, 2018) indicates the FCC's main narrative, which champions the Carpathia project's incontestable benefits, namely, a rise in tourism revenue, the creation of more stable and higher-quality employment opportunities in tourism compared to precarious work in forestry. Furthermore, the report frames environmental safeguards, such as the legal restrictions leading to a decline in grazing, as positive outcomes for conservation. The Carpathia Forest Carbon Project validation report (Carbon Check, 2023) constructs a similar narrative of comprehensive benefits, encompassing both social and environmental spheres (ibid). This perspective, however, stands in stark contrast to the lived experiences and testimonies of local residents. Their accounts reveal a counter-narrative of multifaceted injustices, highlighting tangible and intangible losses and a perceived exacerbation of social and economic inequalities brought about by this conservation process.

Distributional injustice - dispossession, criminalisation, loss of local livelihood and inequality

The establishment of the Carpathian Project has been fundamentally predicated on a process of large-scale land acquisition that has concentrated privately owned and communal forests into

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private hands. As articulated by Iordachescu (2025), this process has alienated areas previously vital for grazing, transhumance and other low-impact livelihoods, leading to social unrest. Unlike Yellowstone, the world's first national park, created by a federal decision, owned by the U.S. government and managed by the National Park Service with public funding, the FCC project in Romania is a private initiative, based on land acquisitions and market mechanisms, which fuels local perceptions of green-grabbing and disputes over resource control.

Furthermore, there is evidence of questionable and, in cases, demonstrably illegal processes that occurred through FCC's forest land accumulation processes. In one specific case, a local resident (farmer/forester) reported waking up to find they couldn't recover an entire mountain because it had been illegally restituted to others, who then sold it to FCC (Interview 9). They described the restitution process as unjust and corrupt, with land given to others through speculation. They had to self-advocate, challenge the illegal sale and have fought and reclaimed some, but not all of their family's confiscated forest lands, whilst all lands remaining subject to external regulation: "FCC has to give their approval for any intervention I want to do in my own forest, which is now part of the national park" (ibid).

Law 1/2000, which restored half of Romania's forests to private and communal ownership (obște or composesorate), is now overshadowed by allegations of corruption and a shift toward concentrated ownership under the FCC, leading to unjust restrictions on fundamental livelihoods as well as to the dispossession and displacement of small and medium-scale timber economies in the name of rewilding and forest protection. One local official, formerly in a civic leadership role spoke about private ownership and restrictions: "Locals own very little, maybe 75ha in total. Most of the forest is communal. Individuals can't log because silvicultural planning is only legal above 100ha" (Interview 6).

The consequences are tangible and severe. Residents now face over-regulation, punitive measures, and a litigious environment, especially after Romania's revised New Forest Codes (2015, 2023), which intensified anti-logging enforcement and criminalisation of forest-related activities. Additionally, to fulfil its ambitions of leading the global fight against climate change and biodiversity loss, the EU, through its new Forest Strategy (2021) and the EGD, is emphasising the need for comprehensive forest protection as vital for a renewed economy and public welfare. However, this "green growth" path comes with the demands of intensified law enforcement and further criminalisation of what is now considered "illegal" logging. In the Carpathians, resource securitisation and criminalisation have brought to the growing of the use of physical as well as insidious forms of violence in the name of conservation, deepening rural vulnerabilities (Iordachescu and Vasile, 2023).

Litigiousness on the part of FCC can also be underlined by its attitude to the Federation of Forest and Pasture Owners, Nostra Silva, which represents the historic communities of the Făgăraș Mountains and has been a consistently critical voice against the project. In 2017, the FCC sued Nostra Silva, accusing it of defamation and seeking damages after the federation publicly criticised FCC's 'Yellowstone' plans. Nostra Silva drew on testimonies of local residents and officials, whereas FCC brought in biodiversity and conservation specialists from organisations like the WWF, Natura 2000 and GreenPeace to further solidify and internationalise their case. Although the first hearing ruled against Nostra Silva, the association won its appeal—a decision later confirmed by the High Court. The final ruling in their favour drew on international law and European Court of Human Rights jurisprudence regarding freedom of expression (Nostra Silva, High Court of Cassation and Justice, 2017). A local representative in a civic leadership role for Nostra Silva identified the case as an example of a strategic lawsuit against public participation or SLAPP lawsuit, aimed at discouraging public dissent: "They hired big law firms, two lawyers came to every hearing, they spent hundreds of thousands of euros without batting an eye. For

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someone unfamiliar with the justice system it would have been difficult and intimidating" (Interview 14).

During public meetings, forest owners consistently highlighted how these forests provide livelihoods and resources and are being exploited within legal quotas. One local resident (forest owner) questioned the lack of a social impact assessment on the part of FCC: "When you proposed this project, did you carry out a social impact study for the area? A study that would include, concretely, fuel supply, the entire community heats with firewood, the need for timber for construction, and the food obtained from grazing?" (Nostra Silva, 2019). These questions are amplified by the reality that firewood is the primary energy source for roughly half of Romania's population living in rural communities. According to Iordachescu and Vasile (2023, p. 2114), the criminalisation of illegal logging has been a key driver of a firewood crisis, thereby pushing energy poverty as the most common instance of everyday violence in the [Carpathians] region".

The historic relationship with the forest for firewood, grazing and picking mushrooms and berries is being replaced by a regime of conditioned access, felt as an irremediable loss: "They put up barriers; we can no longer take the animals to pasture; we no longer have anything to say in forest management" (Interview 13). Within the neoprotectionist or 'fortress conservation' framing, discussion of the ring-fencing of nature is intended more figuratively. That said, some FCC lands can include physical fences or demarcation lines that are enforced by Park Rangers: "installing fences as temporary defence against livestock and patrolling the areas to prevent grazing" (FCC, 2019). The physical fences are perceived by some of the local residents (farmers/foresters) interviewed as mechanisms of exclusion from traditional grazing areas and wood-collecting spaces. People are forced to purchase firewood or bring it from other counties, whilst multigenerational shepherds can no longer traverse FCC-managed woods. As one local official formerly in a civic leadership role noted: "They expelled people from the forests. No more berry picking, no more walks. They talk about 'sustainable development', but I've never seen any benefits for the communities. They just become land barons" (Interview 6). With the collapse of traditional livelihoods, villages once considered wealthy have begun to depopulate. As one local noted, any gains were short term: "People were forced to sell the forest, and they ended up with broken fridges, old TVs, and no land" (Interview 5).

One of the main impacts of dispossession processes is the erosion of community fabric and the exacerbation of pre-existing inequalities. The disproportionate impact is on the most vulnerable, particularly Roma communities. An FCC report showed that money from mushroom picking, a crucial income source for Roma, plummeted from 690,000 RON (c.€136k) in 2016 to 305,000 RON in 2017 (c.€60k), coinciding with the Foundation's land acquisitions (Ungureanu & Promberger, 2018). Now, instead of self-sufficiency, the Roma community receives monthly aid, a dynamic one forest administrator described as manipulative: "When aid comes to our commune... there is always also a forester from FCC there, so that it's visible who is the boss" (Interview 5). Furthermore, FCC employees reported issues with Roma people stealing firewood. Rangers deterred them with tactics like smearing bear fat on their carts to spook the horses. The foundation then sponsored the Romanian Gendarmerie, which, along with controlled hunting grounds, has helped them secure the area, criminalising traditional practices.

The opening of new financial frontiers like the voluntary carbon credit market further exacerbates local disenfranchisement. In Nucșoara, the FCC proposed a sponsorship contract to the town hall for the management of 230 hectares of communal forest, offering €125 per hectare annually against future carbon credits. FCC representatives present the project as a way to profit from the willingness of companies and the EU to pay for carbon sequestration and as a form of support for

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the Nucșoara community, enabling more communities obtain such credits. This position is echoed by the local mayor, who stated, "Our forest emits oxygen, right? ... We have money in the air. So, we can take money from air. We can have 20 billion for development just by selling on the stock exchange." Yet, this offer is made on the condition of a total logging ban and exclusive FCC administration, a stipulation that sparked dissent in the community. Locals accuse officials of corruption and describe public consultations as a sham, claiming they were "announced on the sly, full of town hall employees and FCC sympathisers, without the villagers being truly represented" (Interview 2). Critics point out that with 28,000 hectares, the FCC could generate an annual income of €3.5 million from carbon credits, revealing a primary motive: "FCC is not doing this for the sake of the environment, but because it has found that a lot of money can be made from this story. And the stake is for the administration of this national park to be with FCC" (Interview 7). This perspective, which encompasses FCC practices beyond carbon credit projects, was starkly summarised by a local official in a civic leadership role during an April 2025 high-level meeting in Rucăr, between mayors, members of the local council and FCC representatives. After complaining about the lack of visible benefits and increasing restrictions, he stated: "What benefits do I have with Christoph Promberger? Honestly, this is my principle: from now on I want to sell myself more expensively. The forest and the land have already been sold; I can no longer take them back. But at least from now on we should also obtain something" (Field Notes: FCC Rucar Meeting, 2025).

Procedural Injustice - disempowerment, manipulation and intimidation

The implementation of the Carpathian Project is characterised by a profound procedural injustice, where the systematic disempowerment of local communities starkly contradicts the FCC's narrative of conducive partnership. Local residents and officials consistently report being excluded from meaningful decision-making, facing a "very systematic disregard of local populations and rural inhabitants" (Iordachescu, 2025). This dispossession was marked from the beginning by a lack of transparency, as seen when the FCC, years after promoting the national park memorandum, invited mayors and owners to a meeting outside of their existing acquisitions, in a location where they sought new land. This led to tense confrontations and accusations that their true aim was to "buy even more". This top-down approach has fostered a widespread sense of alienation. One local official in a civic leadership role claimed that "70% of the community opposes the FCC project" (Field Notes: FCC Rucar Meeting, 2025) and condemned its high-level governmental integration without prior community consultation. The decision-making process is widely perceived as a formality; as one resident (farmer/forester) starkly put it, "Public consultations are just a formality, between mayors and FCC, not the people" (Interview 5), a sentiment echoed by a local resident in a civic leadership role, who felt debates were "for show, so things look good in Bucharest and Brussels, but we, the villagers, don't matter" (Interview 2).

The historical region of Muscel, in the South of the Făgăraș Mountains, has been particularly impacted by the project. Here, as explained by Iordachescu (2021), the government's process was notably top-down, as it organized no consultation meetings either before or after its 2016 memorandum. The resulting resistance involved commons representatives and local mayors. Many of these stakeholders demonstrated their opposition by signing the 2016 Resolution of Șercăița, which demanded the government halt the park's establishment and respect their property rights. Another highly impacted group is the Roma (Rudari), who never appear invited to the negotiation table (Iordachescu, 2021).

This exclusion is compounded by a sense of manipulation and the arbitrary imposition of rules that is strongly repeated among the local residents and officials interviewed. The creation of protected areas, national parks and Natura 2000 sites is described as an opaque, bureaucratic process by a former local official in a civic leadership role: "They made a national park without asking anyone. All drawn in offices" (Interview 6). Absurdity is found in the arbitrary drawing of

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borders through one village that places a church and kindergarten inside the regulated zone but not the town hall, leaving people unable to "even change the roof on their barn without approval" (ibid nr 7). In another case, grazing was abruptly banned due to the alleged presence of a rare species of thyme, a measure locals found irrational since "animals had grazed there since the Dacians" and which later proved futile when nettles subsequently grew and killed the thyme anyway (ibid).

The feeling of powerlessness is exacerbated by financial schemes like carbon credit contracts, such as in the case of Nucșoara, where the foundation has already purchased several thousand hectares of land. In 2023, local residents from Nucșoara gathered at the town hall meeting and questioned FCC's aforementioned proposition to 'manage' communal forest with financial promises based on potential carbon certificate trading revenue, that came with imposed conditions (ban on logging, exclusive FCC administration, restricted access). Where such deals are negotiated with mayors, this sparked dissent among citizens who feel unheard and accuse the foundation of functioning as "a state within a state" marginalising local voices (Interview 5). As one frustrated local in Nucșoara said: "We came to the town hall before and [they] told us we were stupid, that we don't understand, that we are just a small group with political interests", going on to ask: "What trust can we have in Carpathia when so many localities are taken over by them?" (Field Notes: Nucșoara, 2023).

Beneath this disempowerment lies a strong undercurrent of mistrust, with repeated accusations of corruption, deception and long-term strategies of co-optation. Local officials suggest that FCC operates with immense patience and financial power, working "through proxies" such as commercial companies and research institutions. Their strategy is perceived as a long game: "They wait for the old folks to die and try to win over the young" (Interview 6). This is actively pursued through consensus-building strategies that many in the community view as insidious. The FCC organises educational programs in schools, offers scholarships and hosts events like the annual Făgăraș Fest, an advocacy platform explicitly used to rally support for the national park. These public relations efforts are a source of deep anxiety for residents, who worry that the new generations are no longer attached to the forest. They witness their own children influenced by these programmes, as one local official in a civic leadership role explains: "Now our children come home in electric cars and ask us why we want to cut the forest. We told them they will end up strolling through our properties like at the zoo" (Interview 7).

Finally, for those who resist, the experience is often one of intimidation and bullying. Residents involved in community resistance report tactics of humiliation and threats of legal proceedings, creating an atmosphere of fear. This, combined with the perceived pacifying tactics of youth funding and educational programs, is described within the community as fostering a coercive environment where dissent is stifled. While these initiatives could be presented by FCC as evidence of community investment, this study's findings highlight a community experience in which such measures are seen alongside a failure of justice and state institutions to offer protection, perpetuating a cycle of broken development promises. FCC-based alliances between local and global NGOs, philanthropists and private capital have led to a shift in decision-making power from villages to transnational actors (Vesalon and Anghel, 2023); transforming nature into a financial and tourist asset legitimised through narratives of wilderness restoration and ecological crisis. The benefits, as one local official summarised, are perceived to be for "International elites and foreign interest groups", who are seen as the winners, whilst "Local communities are the losers: they're losing land, resources and any chance at development" (Interview 6). This pervasive sense of disenfranchisement, manipulation and intimidation lies at the heart of the procedural injustices engendered by the conservation project.

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Recognition injustice: Erasure of socio-ecological heritage, commodification of nature, and new human-wildlife tensions

A fundamental recognition injustice underpins the Carpathian Project, where FCC systematically overlooks and devalues the historical, cultural and sustainable relationships that local communities have cultivated with their environment for centuries, especially through their forest commons - 'obște' or 'composesorate' - considered by Iordachescu (2025) as democratic institutions and veritable conservation actors, serving as safety nets for communities and investing in local infrastructure. This dynamic was laid bare during the public presentation of the project "Together we restore nature for the communities of the Făgăraș Mountains" (2019), when FCC's executive director, Barbara Promberger, expressed that she was "impressed by the intact nature you have here and which Romanians have protected1", contrasting it with developed countries like Germany and Austria that "have lost these habitats". This narrative, however, ignores the very agents of that protection. As one local official in a civic leadership role counters: "The people in these villages have lived in harmony with nature for hundreds of years; that is why there is still something to protect now, because people have left things undestroyed" (Interview 7).

For residents, the *composesorate* are deeply tied to community identity, history and continuity as a traditional institution safeguarding community forests. Viewed from this communal and embedded perspective, the forest is not a wilderness to be discovered but the bedrock of "life and tradition", a sacred heritage passed down through generations. As one local resident (farmer/forester) explained, "For us, the land is sacred, not just a resource. It is about heritage: it is from my father, from my grandfather" (Interview 11). This profound, place-based knowledge and care conflicts with media narratives that glorify a pristine 'wilderness' for the Yellowstone of Europe project, leading to frustration that "no one came to write also about what people think" (Interview 5). This process effectively erases the social history of the forest, reimagining it as an aesthetic and financial object for external valorisation.

This lack of recognition creates a stark contradiction in FCC's actions. While the foundation discursively celebrates human-nature interactions in projects like the "Architects of Nature" themed trail, which illustrates the role of humans, bison and beavers as co-creators of the landscape, it simultaneously undermines the tangible practices that constitute those interactions. For instance, whilst promoting traditional activities for tourism, FCC representatives have been bothered by the practical realities of local life, such as cows roaming freely, with one former employee complaining: "All day long the cows came and you had to chase them away... The locals didn't keep them in check" (Interview 8). This exemplifies a model where traditional practices are commodified into eco-tourism, while simultaneously being restricted and criminalised in practice. The result is a profound intangible loss for the community—a severing of the connection to land, nature, and heritage based on a system of trust and shared resources. A former local official in a civic leadership role emphasised this deep bond: "People are deeply connected to nature in rural and mountain areas... I rely on this bond with nature" (Interview 6), a bond now compromised by a conservation model that 'protects' nature from its historical caretakers. This 'neoprotectionist' approach to conservation (Buscher and Fletcher, 2020) deliberately separates human and non-human nature, both figuratively and physically, creating "resource sanctuaries" that obfuscate the human footprint in 'virgin' forests (Iordachescu, 2025), consolidating land ownership and forming a perverse new model of forest feudalism.

The failure to recognise existing, balanced human-nature relationships has also dangerously altered the ecological dynamics of the region, most notably leading to an increase in dangerous wildlife-human interactions. On both slopes of the Făgăraș Mountains, locals report living in fear due to a surge in bear attacks. Shepherds and farmers have lost animals, and many feel "locked in their homes out of fear", with one resident stating: "Until the other day we used to take the cow

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to pasture, now I sit with the fear of the bear behind the house" (Interview 12). This dissatisfaction is compounded by the fact that the FCC was accused of being involved in drafting the 2016 law that banned bear hunting and now manages several hunting grounds. In the eyes of locals, this policy has directly led to an explosion in the bear population and the subsequent attacks, for which the foundation is often blamed directly. This sentiment is exacerbated by a perception of biased media coverage, as a former forestry employee recounted: "The mass media was paid... They only come to the foundation's events" (Interview 13).

Lack of recognition is reproduced also in the carbon credit voluntary market engaged by FCC. While presented by FCC as an opportunity for local economic growth and development, there is a growing literature that points to the risks associated to carbon and biodiversity credits, especially to the lack of integration, in such schemes, of "needs, values and perceptions of rights holders", thus reproducing inequalities and multiple types of injustices (Clifton and Manez, 2025; see also Fletcher and Buscher, 2016, "The PES Conceit: Revisiting the Relationship between Payments for Environmental Services and Neoliberal Conservation").

The various forms of environmental injustice experienced by the local population in the Făgăraș Mountains sparked social resistance against the FCC and its conservation project. However, as Iordachescu (2021) contends, this resistance should not be interpreted as opposition to conservation per se. He emphasises that local communities have cultivated sustainable resource management for centuries through traditional commons. Instead, this skepticism should be read as a rejection of top-down conservation models that seek to preserve an idealised and commodified "wilderness" - a narrative alien to local lived experience, which disregards both historical land-use practices and the cultural significance of these landscapes for their inhabitants

Main Results

This case study reveals that the implementation of top-down EU green transition policies, as channelled through FCC's ambitious Europe's Yellowstone project, has created a green sacrifice zone in Romania's Făgăraș Mountains. While advancing biodiversity targets, this model of philantrocapitalist conservation generates severe socio-environmental injustices, fundamentally altering the region's social fabric and power dynamics. The main finding is that the pursuit of strict wilderness protection, legitimised by the EGD (primarily the EU Biodiversity Strategy 2030 and CRCF certification), has systematically privileged global ecological and financial values over local socio-ecological systems, producing clear winners and losers.

The primary impact is a triad of interconnected injustices. First, distributional injustice manifests through processes of green grabbing and dispossession. The large-scale, often contentious acquisition of forest land has restricted access for traditional livelihoods like grazing, timber collection, and foraging. This impact is disproportionately felt by the most vulnerable, such as the Roma community, who have seen a dramatic decline in income from activities like mushroom picking, pushing them into greater dependency on external aid. Tangible losses are therefore manifest through communities forced to purchase firewood and through rural depopulation, while new financial ventures like the Carpathia Carbon Finance Project risk further alienating locals from potential benefits. Second, procedural injustice is rampant, as decisions are made through opaque, top-down processes. Local communities report being systematically excluded from meaningful consultation, with public debates perceived as formalities for external investors and policymakers. This disempowerment is compounded by consensus-building strategies that target youth and create dependencies, alongside intimidation tactics against dissenters. Third, a profound recognition injustice occurs through the erasure of local heritage. FCC's 'wilderness' narrative overlooks centuries of sustainable stewardship by local communities, framing their ancestral lands as a pristine nature to be saved. This devalues their knowledge and severs their

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cultural connection to the forest, which is re-imagined as a commodity for ecotourism and carbon markets.

Consequently, the main "winners" of this green transition are transnational actors: the FCC itself, which consolidates power and access to new revenue streams; its international donors and partner NGOs; and global tourists who gain access to a curated wilderness experience. The clear "losers" are the local communities, who experience a loss of autonomy, resources and cultural identity. They face criminalisation of traditional practices, heightened vulnerability due to wildlife conflicts exacerbated by conservation policies and the erosion of their social fabric. Institutionally, the Romanian government acts as a key enabler, supporting the FCC as a vehicle to meet strict EU biodiversity targets. This dynamic has polarised civil society: while major international and national environmental NGOs promote the project, local community groups and a critical press offer a powerful counter-narrative that frames the process as an unjust form of dispossession and disempowerment.

The anticipated costs and benefits of "Europe's Yellowstone" (actual or demonstrable, anticipatory or promissory) are thus distributed asymmetrically. The benefits – among which: progress on EU biodiversity metrics, carbon sequestration, and the creation of a wilderness reserve for science and tourism - accrue to global and national constituencies. Instead, the costs are overwhelmingly borne by the residents and local representatives of the Făgăraș region. They consistently report tangible and intangible losses and damages, which are underpinned by intergenerational knowledge and informed experience, culture, sense of place and ways of being. The case therefore demonstrates that without embedded community participation, socio-environmental justice (Iordacescu, 2022), even well-intentioned conservation policies can perpetuate the very inequalities the green transition aims to resolve, sacrificing local well-being for global environmental goals.

Discussion and conclusions

By analysing the ecotourism park in the Făgăraș Mountains, this case has shed light on a significant and under-researched aspect of the EU green transition: GSZs that manifest not through renewable resources extraction but through a renewed push for environmental conservation, forest rewilding, and the expansion and securitisation of strictly protected areas. The study's main contribution is to the environmental justice and political ecology scholarship on GSZs and conservation, and especially to the literature on the Foundation Conservation Carpathia (FCC) project.

The Carpathia Project, justified as a way "to repair the harm done by humans... by giving the land back to nature" (Iordachescu, 2021, p. 196), is analysed here as a new frontier of land control that mimics global green grabbing and relies on processes of "dispossession, rights transfer and securitisation of resources" (Ibid). Following Iordachescu (2021), the peripheralization of certain regions is central to this project, particularly the eastern EU's imagined "green periphery" that emerged after the fall of the Soviet Union. Termed by the author as "The New Wild West", this periphery is represented as a great opportunity for conservation (ibid, p. 190), yet it has been characterised by growing "green violence" as a consequence of the hardening of law enforcement and criminalisation of illegal logging—a form of violence that has disproportionately targeted the most vulnerable, already marginalised rural communities, especially Roma (Iordachescu and Vasile, 2023). While environmental protection itself is not under critique, legitimate concerns persist regarding greenwashing and philanthrocapitalism. Central to this case are fundamental questions about whose "nature" is being prioritised, and who benefits.

This study has showed that the FCC project has been backed by EU conservation policies and funding, international donors, NGOs and mainstream media and aligned to the EGD. Its narrative

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is built upon a win-win scenario of biodiversity restoration, forest rewilding, economic growth and social development. Its environmental benefits, particularly in terms of rare species protection and re-insertion, are impossible to overlook. And yet, “accumulation by conservation” exploits structural inequalities to pursue its benefits (Büscher and Fletcher, 2015). As Büscher and Fletcher (2015, p. 288) point out, more pertinent to “the net costs and benefits of conservation activities” is the need to analyse “how these differentially impact various stakeholders involved in these activities”. Following this perspective, this case study focused on processes of distributional, procedural, and recognitional environmental injustices caused by Carpathia Conservation and the resulting losses and damages for residents. However, it reveals more than a simple discourse of local communities being negatively sacrificed for environmental benefits. What is at stake in the Făgăraș region is the sacrifice of place-based, interdependent, human-nonhuman models of coexistence that "stand in the way of industrial extraction and neoliberal conservation” (Le Billon, 2021) yet potentially represent alternative, more sustainable and fairer, forms of conservation.

The FCC’s 'environmentalism' is deeply rooted in a commodified idea of nature-as-value: a 'pure’ 'wild' value-making entity separated from and forcibly protected against human interference. This is evident in ecotourism, and even more so in the project's recent expansion into carbon credit markets – a development we conceive as a dual commodification of nature. Portrayed as a transformative economic benefit for locals, these processes are underpinned, in practice, by a market-driven strategy reliant on green grabbing. Voluntary carbon credit trading - promoted by the EGD - represents a quintessential expression of this commodification and, as Bogojevic (2024, p. 204) notes, faces “tricky” legal questions, specifically the need to define “which situations allow for reliance on carbon removals (or what makes a socio-economic cost ‘unreasonable’)”. This is a critical concern, as these markets will undoubtedly lead to more entangled relations with extractivist and polluting corporations who are thereby disincentivised from reducing emissions. Indeed, as Le Billon (2021) showed, many conservation organisations offer a spatial and ecological fix for extractivist polluting projects, which need to secure future environmental licenses, in exchange for funding through mechanisms like carbon credits. Instead of complying with carbon emissions targets, industry can pursue carbon offsetting, thereby displacing, not removing harmful emissions whilst promoting new market-based instruments “intended to combine forms of (neoliberal) economic development with environmental conservation” (Büscher and Fletcher, 2020, p. 19). According to Le Billon (2021, 869), this *modus operandi* has progressively less to do with a “green philanthropy” dreaming to rewild places and more to do with a need to produce “future (and new) values out of 'nature'”.

This rationale makes our argument on conservation-led GSZs even more pertinent. By taking nature “out of an extractivist commercial logic” to “a non-extractive circuit (for ecotourism or contemplation)” (Iordachescu, 2021, p.196), conservation-led GSZs incentivise processes of nature commodification and green grabbing that produce multiple forms of injustice for local populations, while also altering or even erasing convivial forms of human-nonhuman relations. The participation in the voluntary carbon credit market - a foundation for many major conservation projects - risks further sidelining local communities’ wellbeing and turning their forests into a commodity for distant polluters without delivering local justice.

In the Carpathian Mountains, the formation of a GSZ resulted from the replacement of post-communist "fiefdom forests" and "timber barons" with a modern system of forest feudalism. This system operates on a "resource sanctuary" model (Iordachescu, 2025), which uses myths of pure wilderness and a rigid human-nature divide to legitimize strict policies and obscure the historical human presence in the area (see Uggla, 2010). This approach prioritises protecting nature while overlooking the need to protect people. The resulting tension is clear in the daily lives of Carpathian rural communities, who experience large-scale conservation projects less as opportunities for sustainable development and more as forms of green violence, environmental

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injustice, and material and intangible losses, all without tangible socio-economic benefits. This pattern of local marginalisation is not isolated. Duckett et al. (2022) demonstrate that rewilding and species reintroduction in four EU countries have negatively impacted small-scale farm production and food security, echoing complaints from the Făgăraș region about tensions related to bear reintroduction. Furthermore, this dynamic reveals a flawed conservation logic, as illustrated in another Romanian case from the Danube Delta discussed by Ioana Savin Bursan (webinar, 2025). There, the role of locals changes dependent on ownership, a process that transforms "historically marginalised population ... from stewards to poachers" and an "impediment for conservation". This dynamic highlights how the role of the human footprint in nature is framed in neoprotectionist visions of conservation, where there is peripheralisation and, in some cases, criminalisation of historical populations and practices.

Ultimately, by revealing the social costs of current models, this study supports recent scholarly calls to adopt 'convivial conservation' as a strategy for rebalancing the relationship between humans and non-humans in the new protectionism of the Anthropocene, by centring the sustainable co-existence of human and non-human nature (Büscher and Fletcher, 2020). Without this shift, the EU's green transition risks being defined by fast-tracked policy loopholes for neo-conservationist, extractivist, and carbon-offsetting schemes—measures that perpetuate the very social inequalities they claim to resolve by sacrificing local well-being and justice for global environmental goals. In crafting large-scale transformative policies like the EGD, risk assessment, public consultation, and precautionary thinking are often sidelined in the name of progress. As Almeida et al. (2023) note, the EGD's transformative ambitions echo historical colonial and neo-colonial patterns. Similarly, Nacu and Jercan (2023) frame the EGD and the SDGs as part of an "environmental economy" shaped by Western, Euro-centric positivism and ambiguous policy rhetoric.

As this study demonstrates, EU conservation policies are not immune to these patterns and must be replaced by alternative paradigms for biodiversity conservation. The convivial conservation proposal (Büscher and Fletcher, 2020; Iordăchescu, 2022) offers one way of reconceptualising large-scale, fortress-style neoprotectionist projects towards decentralised, community-led initiatives that foster human-non-human nature coexistence. It proposes baking-in diversified local economies, agroecology and sustainable traditional practices to policy design, rather than replacing them. Crucially, EU and national forestry and biodiversity policies must recognise and remunerate, the active, skilled labour of communities in maintaining ecosystem. As Velicu (webinar, 2025) underscores, beyond the policy, the idea of conviviality is built on interdependence, democratic and equalitarian principles, rooted in post-extractivist imaginaries of development to drastically rethink what ecological transformation of our societies would actually imply.

Recommendations

The case of the FCC in Romania's Făgăraș Mountains emphasises dangers of overreaching the implementation of EGD-related conservation policies. To prevent the creation of further cycle of conservation-led GSZs and to align the green transition with SDG and EGD principles of environmental justice social equity and 'leaving no-one behind', the EU Biodiversity Strategy should explicitly promote **convivial conservation** as a viable model. This approach adapts the proposals of Büscher and Fletcher (2020, p. 186-197) by centering on existing, proven models of grassroots governance and stewardship, such as the Romanian commons (*obști*), as detailed by Iordacescu (2022). The following integrated policy actions are proposed:

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1. **Mandated and Meaningful Community Participation**: EU biodiversity and forest policies and associated conservation law must centre co-design processes for conservation projects affecting local communities. This involves formally integrating traditional governance institutions like the *obști,* federations for the rights of forest owners, or other federations that defend the rights of forest owners as essential partners, recognising them **as Other Effective area-based Conservation Measures (OECMs)** to validate their historical and contemporary role in biodiversity stewardship and break from top-down protection models.
2. **Rethinking Conservation Finance and Providing Reparations:** Conservation finance should be reoriented to support communities directly. This includes a) **channeling a Conservation Basic Income (CBI) through commons institutions** to reward their stewardship, building on the positive outcomes of existing CAP direct payments (Buscher and Fletcher, 2020; Guyomard et al., 2023); b) **implementing historic reparations** for the loss of communal lands. Furthermore, the allocation of EU funds (e.g., LIFE programme) must be conditional on integrating rigorous, participatory **Social Impact Assessments (SIAs)** to pre-emptively evaluate impacts on vulnerable groups and traditional livelihoods and contingent on NGOs meeting the required status (including recognition between non-profits, not-for-profits and for-profit foundations).
3. **Ensure Justice and Equity in Human-Wildlife Coexistence Strategies**: Biodiversity policies must holistically address the socio-ecological consequences of species reintroduction and protection. This requires allocating dedicated EU and national funds for effective, community-supported conflict mitigation measures (e.g., predator-proof fencing) and ensuring that compensation schemes for damages are accessible, timely and fair, with local communities involved in their design and implementation.
4. **Redirecting Governance and Countering Green-Grabbing:** Support must be redirected to the **polycentric, self-governing models of commons**, leveraging their democratic decision-making for a robust conservation system. Simultaneously, the EU must **establish stricter oversight for large-scale land acquisitions** by creating public registries of conservation deals and supporting independent watchdogs and Citizens Observatories in scrutinising power dynamics and preventing green-grabbing. For example, lessons could be taken and shared with the EC's Directorate-General for Agriculture and Rural Development (DG-AGRI) European Observatory on Agricultural Land.
5. **Fostering Just and Equitable Conservation Coalitions:** Policy must support the creation of Convivial Conservation Coalitions structured around commons, enabling them to redesign local commodity chains.
6. **Commissioning research on dimensions of Environmental Justice and the EU Carbon Credit Market:** Policies that facilitate carbon farming and Payment for Ecosystem Services (PES) must safeguard against green grabbing and operate as an addition to, not a replacement for industrial emission reduction targets. This includes ensuring voluntary carbon credit projects on communal or customary lands cannot proceed without the direct and collective consent of the community. Further research is needed to critically appraise the socioeconomic impacts of value chains of the carbon credit market and establish mechanisms that prevent the consolidation of carbon farming resources by private enterprises. Such research could focus on a new policy roadmap to end the "forest finance gap" launched at COP30 in Brazil in November 2025 that includes, at the top of its list of levers for scaling finance, a need to "Increase demand for high-integrity jurisdictional forest carbon credits" (Williment, 2025).

By implementing these recommendations, policymakers can help ensure that the EU's laudable green ambitions do not exacerbate social inequality and environmental injustice, thereby fostering

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a truly sustainable and equitable transition that prioritises the conservation (not monetisation) of nature and is dynamic by design to reflect and protect communities that have stewarded it for generation.

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1.3 Case study 3: Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)

Overview

Since 15 July 2025, Spain has ceased generating electricity from coal in its thermal power plants, as these facilities were unable to make the necessary investments to reduce emissions. Many of these sites will be repurposed to produce electricity from renewable sources, contributing significantly to Spain's and Europe's decarbonisation and energy transition goals[1]. In 2025, all coal-fired power plants in the country have either completed their shutdown, are in the process of closing, or are subject to medium-term decommissioning plans (MITECO, 2024b). Similarly, coal mines have been forced to close since December 2018 due to their inability to compete in the global market, supply national thermal power plants, or return the aid they had received. The coal restructuring and reconversion process gained importance in Spain during the 1990s, but the last two policy frameworks for mine closures have accelerated the phase-out of coal mining and coal-fired power generation (Ministerio de Industria, Energía y Turismo, 2013; MITECO, 2018).

The last framework agreement (2019–2027) for the just transition of coal mining and the sustainable development of mining regions was developed in line with the end of coal extraction subsidies in Europe and within a policy context increasingly focused on tackling climate change. In 2019, the Spanish Government launched the Strategic Framework for Energy and Climate, which includes the Just Transition Strategy. As part of this strategy, the Just Transition Institute of the Ministry for the Ecological Transition and the Demographic Challenge created the Just Transition Agreements (JTAs). These agreements are a co-governance tool designed to ensure coordination among public administrations and provide support instruments for the transition process. Their main objective is to maintain and create economic activity and employment in territories affected by the energy transition. This reportedly includes supporting productive sectors and vulnerable groups, stabilising population in rural areas with closing facilities, and promoting new, diverse economic activities aligned with local socioeconomic contexts. Ultimately, the JTAs seek to achieve zero net impact on employment in these regions.

Spain has established 15 JTAs across different regions; this case study focuses on the one corresponding to El Bierzo and Laciana in León (northern Spain), which have been visibly affected by the cessation of mining activities. Public participation is encouraged, involving companies, unions, municipalities, academic institutions, and NGOs to propose projects that rebuild the local economy. Submitted proposals are assessed for economic, social, and environmental viability, and selected initiatives receive technical support and financing guidance. Main actions include support for job-creating businesses, municipal infrastructure, cultural projects, environmental restoration of mining areas, and innovation competitions in 'just transition nodes[2]'.

[1] Through the 'Fit for 55' package, as part of the European Green Deal, and the 'REPowerEU Plan', the EU aims to reduce net greenhouse gas (GHG) emissions by at least 55% by 2030 compared to 1990 levels, in accordance with the European Climate Law, and to achieve climate neutrality by 2050 (net-zero emissions)

[2] 'Just transition nodes' are those where the capacity to access the electricity grid – freed up after the closure of closed thermal or nuclear power plants – is awarded by tender to be used by new renewable energy plants that are connected to the node.

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While various quantitative reports (European Commission, 2025; MITECO 2024a; Instituto para la Transición Justa, 2025), have assessed the potential and actual impact of just transition policies on employment, there is a lack of qualitative data and analysis that serves to understand the voices within affected areas and bring local perspectives to the forefront. Beyond counting jobs lost or created and classifying them through the brown–green dichotomy, this study raises questions about the quality of future employment and the type of economy to emerge in the new context. The contribution of this case study to the GreenPaths project lies in its broader scope, addressing the complex and multi-dimensional nature of planned transitions. It moves past the economic impacts of policies funded by the Just Transition Fund and the European Social Fund+ to address transitions that affect entire communities and ways of life. This approach reveals gaps between agreements and outcomes, offering insights to design coherent, effective strategies and instruments that minimise negative environmental and social impacts.

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Research questions

Mandelli et al. (2023) highlighted the persistent lack of integration of social objectives and action plans within national climate and energy policies across EU countries, as well as the associated research gaps. Nevertheless, they identified two key policy frameworks addressing the social dimensions of decarbonisation: the European Pillar of Social Rights and the European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience. In addition, the European Commission's Just Transition Mechanism encompasses a range of core instruments designed to meet these ambitious expectations. Several scholars have already addressed the socioeconomic impacts of fossil-fuel phase out: barriers to re-employment of workers displaced from carbon-intensive industries, particularly where reskilling initiatives are insufficient (Haug et al., 2018; Chun, 2024; Seo, 2021); wage stagnation and long-term sectoral decline (Rud et al., 2024); rising energy and transport costs further burden low-income households (Frondel et al., 2015; Wier et al., 2005). Overall, the transition disproportionately affects low-income and low-skilled workers (Baran et al., 2020; Chateau et al., 2018), not merely through job and income losses but through structural failures to reintegrate displaced workers into new roles (López et al., 2024). There is however also a territorial component to be considered, since certain locations may face greater risk due to aspects like geography or prior industrial structures, or because climate policies such as decarbonization will disproportionately impact them (Rodríguez-Pose & Bartalucci, 2024; Zahnow et al., 2025). Sanz-Hernández et. al. (2020) used a policy mix analytic framework to understand vertical political integration of global/EU energy targets and explore policy recommendations for the design of the JTAs applied to the case of Aragon region. They identified 94 policy barriers, grouped and discussed thematically (economy, policy, social, technology, environment). The researchers called for further empirical research to capture cognitive-cultural components and state that long-term transition plans need more than 'palliative and shock-absorbing instruments' and should assess 'structural change and policy readjustment'.

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This case study seeks to understand how affected communities perceive just transition policies, including their adequacy and fairness, local concerns and expectations, and issues arising during implementation of a JTA. With this goal in mind, the main research question asks: '*How do Just Transition Agreements impact the social well-being of communities affected by the closure of thermal power plants and mining operations in the Spanish region of Bierzo-Laciana*?'.

Several aspects of this perceived impact are considered, including employment quality, implications for public administration, economic opportunities, responses from affected individuals, training and requalification needs, and the distribution of effects on inequalities. To articulate the research, the study analyses the following empirical questions:

1. *How are the labour conditions of the new job positions and employment opportunities generated by the JTAs?*
2. *What is the impact of the JTAs on the productive and social fabric of the affected areas?*
3. *How is the adaptation of the affected communities specially compared to the expectations?*
4. *How are perceived and appraised the processes of training/updating of skills by the communities and which perspectives do they offer for the new generations?*
5. *Is the impact of the policies evenly distributed throughout the different collectives?*

These research questions help address GreenPaths' primary objectives by shedding light on the environmental and social impacts of closing mining facilities and thermal power plants—a key step in decarbonisation and just transition roadmaps. They complement official monitoring reports with local perspectives and unquantified perceptions. This approach also maps key actors and identifies social and economic costs and benefits, supporting the design or revision of policies, particularly in areas where closures are still pending.

This case, focused on El Bierzo and Laciana, involved a wide range of actors, including trade unions, educational centres, scholars, associations, environmental organisations, development agencies, local action groups, former workers and other interested entities. Specific participation frameworks for youth and women were also established by policymakers. These actors are considered key sources of information as they both witness the process and belong to the affected communities.

Different factors and variables related to the differential social impact were considered during the execution of the research. Some anticipated in the planning phase, whilst others were identified in the field, through the interviews and focus groups: age; result of the closure for the workers (early retirement/need for further income source); direct contracting or through subcontracting; geographical location and size of the municipality. Gender has been also incorporated as a secondary variable that affects a subset of the population traditionally ignored when researching contexts where male-dominated jobs are at stake.

Methods

The study adopts a qualitative approach to explore perceptions of just transition policies, focusing on their adequacy, fairness and local concerns. While aligned with the project's conceptual matrix, the social impact the case centres on is 'labour', it also considers related categories of

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'mitigation/adaptation' and 'governance/policies', with 'decarbonisation' and 'fossil fuel phase-out' as guiding concepts.

The main target population of the study consists of groups most vulnerable to the impacts of just transition policies were sampled based on: economic activity threatened by the closure of specific sectors; risks of displacement and the abandonment of rural territories; and a need for processes of specialisation and diversification aligned with the socio-economic context.

Fieldwork included 15 interviews (stakeholders from institutions, trade unions and local organisations, as well as former workers) and 2 focus groups (young people and women). Local and regional authorities, Just Transition Institute officials, trade unions, former workers, scholars, and neighbours of the affected communities have been consulted for the interviews. The interviews were divided into 2 categories: 'community members' and 'expert voices'. Interview scripts were adapted for each expertise, however, the expert profiles were grouped into three categories: institutions were represented by public officials (mayors of municipalities affected, regional representatives, county representatives); trade unions were represented by officials at different levels of different trade unions; and other organisations' representatives included local associations, academic experts and teachers, heads of training entities. The focus groups were formed by a set of young people and set of women respectively.

A total of 28 people participated in the study (10 females and 18 males). All these participants provided insights into the social and economic costs and benefits of the transition, complementing quantitative data and official reports. The details of the methodological deployment are described in Table 5.

Table 5. Overview of Discussion Groups and Interviews

Interviewees	**Quantity**	**Description**
Expert voices	12	Three categories: Public office representatives (5); trade union representatives (3); other organizations (4). Male and female.
Community members	3	Former workers and residents of affected areas (3). Male and female.
Focus groups		
Women	1	6 women from Laciana county
Young people	1	2 male from Laciana county; 3 male from El Bierzo county; 1 female from Laciana county; 1 female from El Bierzo county.

The fieldwork faced several challenges. Many former workers were hard to reach, as the closure of thermal power plants and mines forced them to migrate to other regions or countries. The lack of alternative economic projects made it difficult to assess new jobs or consult workers relocated to other industries. Collaboration from some profiles, such as company representatives or business organisations, was also limited.

The long restructuring process, ongoing since the 1990s through successive agreements, complicated the contextualisation of responses, requiring emphasis on recent closures and related policy tools. The complex network of public policies—plans, strategies, frameworks, laws and agreements at multiple administrative and geographical levels— and financing sources, also hindered efforts to focus assessments and opinions on a single instrument, the JTA. To a lesser

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extent, environmental aspects were overshadowed by economic concerns, particularly the competitiveness of mining in global markets.

Analysis identified insights across five categories: 'employment', 'local development and social/productive fabric', 'adaptability', 'training', and 'inequalities/comparisons'. Reviewing interviews and focus groups revealed common narratives as well as differences between groups defined by job type, location, age and gender.

Findings and results

Context of the phenomenon

Mining regions have traditionally depended on coal, a reliance compounded by population dispersion, isolated settlements, poor infrastructure and environmental degradation—factors that hindered territorial cohesion and alternative industries. Council Decision 2010/787/EU set the deadline for 'uncompetitive' coal mines to close by 31 December 2018, while Directive 2010/75/EU required thermal power plants to invest in emission reductions or shut down by 2020. Coal-fired electricity generation peaked in Spain in 2002 at about 75 TWh (20% of total), then declined steadily: 14% in 2018, 2% in 2022, 1.5% in 2023 and just 1.1% in 2024[3]. In 1990, Spain's coal sector comprised 234 mining companies employing 45,212 workers and producing 19.32 million tonnes. By 2012, this had fallen to 15 companies with around 3,400 workers and 6.5 million tonnes of output. In contrast, at the beginning of 2018 coal mining was made up of only 9 companies that employed a total of 1,833 people in their own workforce and 565 people in subcontractors[4].

These data indicate that the decline of coal in Spain is not a recent phenomenon. Since the 1990s, the definitive closure of mines in Spain has been repeatedly postponed through successive agreements. The penultimate agreement (2013–2018) failed to halt depopulation or the decline in economic activity and employment, leading to rising unemployment—particularly among young people—and severe depopulation in mining areas. The most recent and final agreement acknowledged the inability of domestic coal to compete with imports without state subsidies, thereby consolidating the path towards permanent closures. In parallel, the shutdown and conversion of thermal power plants have exacerbated the socio-economic impacts on affected regions. This situation affected not only direct employment but also subcontracted workers, auxiliary services, and an entire ecosystem of secondary and tertiary activities.

Recent redevelopment policies for mines and thermal plants introduced measures to mitigate closures, including:

- **Labour and social protection** (early retirement, redundancies, relocation, training).
- **Economic and territorial development** (investment in renewables, circular economy, agri-food, tourism, R&D, and environmental restoration prioritising former workers).
- **Energy and territorial tools** (renewable energy tenders, municipal infrastructure upgrades, heritage programmes, and water concessions).

[3] Source: Red Eléctrica de España (https://www.ree.es/es/datos/generacion)
[4] Source: Ministerio de Industria, Energía y Turismo, 2013 and MITECO, 2024a.

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Many other EU countries also decided to draw up closure plans, including Germany, Poland, and Romania, which shows that Spain's situation is not exceptional. Official sources claim that restructuring plans safeguarded workers and enabled an orderly closure of mining activities while improving infrastructure. However, economic diversification was uneven, poorly planned, and lacked dynamic evaluation. Although these measures reactivated some regions, they failed to resolve key challenges. The 2013–2018 plan, implemented during the economic crisis, worsened conditions: most mining firms went bankrupt, restoration stalled, and many projects were cut due to austerity (MITECO, 2024a).

Among the numerous policy initiatives, the JTAs include a comprehensive territorial action plan for those regions where the energy and ecological transition may pose difficulties for economic activity. There are 15 JTAs for 15 geographical areas all over Spain, but the current case study focuses on that of El Bierzo and Laciana in León, which is a province in northern Spain that contains a total of 18 locations included in the JTA, considered as “transition municipalities”. Among various policy initiatives, the JTAs provide territorial action plans for regions facing economic challenges during the energy transition. The objective of the agreement is to address the impacts derived from the closures of the mining operations of Gran Corta (Fabero), La Escondida (Villablino), Salgueiro (Torre del Bierzo) and Alinos (Toreno), as well as the power plants in Compostilla (Cubillos del Sil) and Anllares (Páramo del Sil).

Figure 3. Geographical location and scope of the JTAs

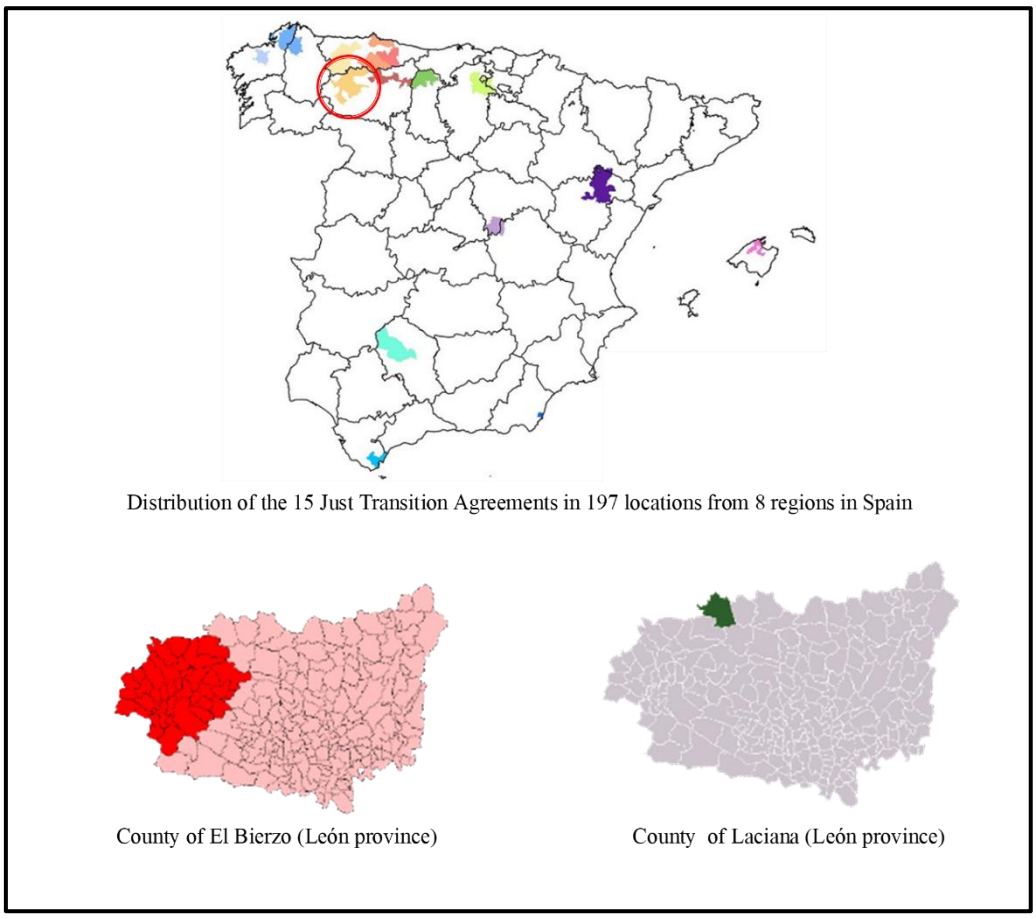

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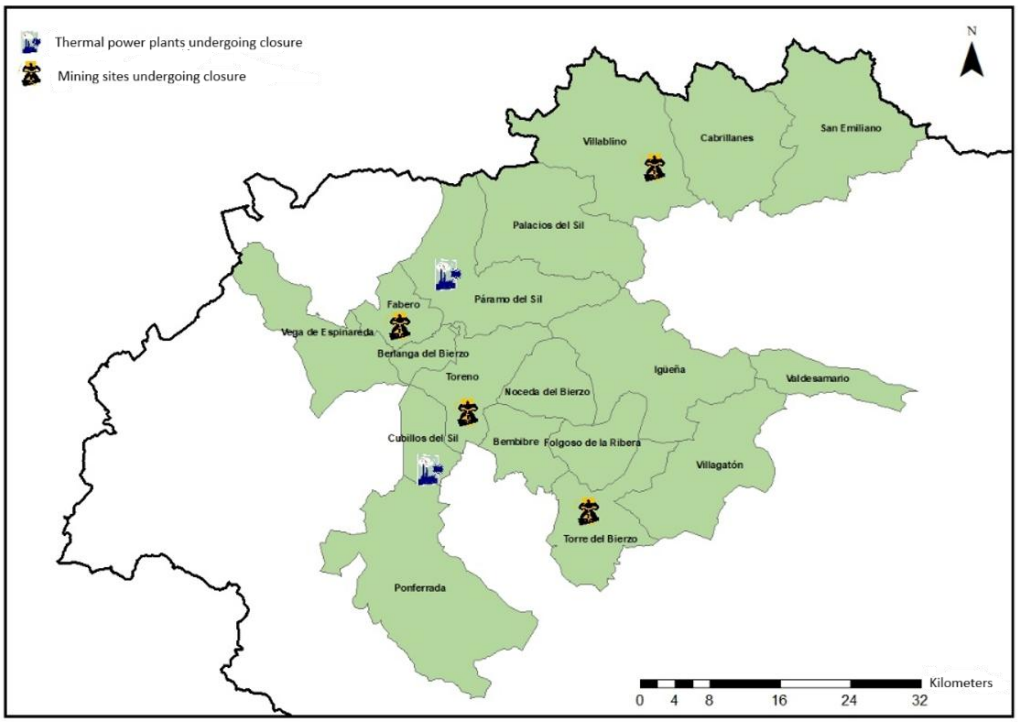
Figure 4. Subset of locations included in the Just Transition Agreement Bierzo-Laciana



In October 2020, a General Protocol was signed by national, regional, and intermunicipal agencies to design a JTA for El Bierzo-Laciana, aiming to revitalise economic activity and employment after coal and plant closures. This was followed by an impact assessment diagnosis to set objectives, a participatory process to collect initiatives and proposals (still active), and the evaluation of proposals and identification of tools (still active). Among the sources of financing are the State General budget, the Recovery, Transformation and Resilience Plan (Next Generation EU), and the European Just Transition Fund. The agreement addresses closures affecting 660 workers and, since 2019, has allocated over €271M in aid to workers and territories affected by the energy transition in El Bierzo-Laciana. They have also supported directly 68 restoration, business, energy and municipal projects, the implementation of which is estimated to mobilise €973M and create 501 new jobs.

Contrary to expectations, employment improved slightly between 2017 and 2020, with unemployment in JTA-targeted areas falling by 2,065 people (Table 6). However, this trend must be considered alongside population ageing, the prevalence of early retirements, and the overall demographic decline of these municipalities. Between 2017 and 2024, these localities lost over 7% of their population on average, amounting to 7,643 fewer inhabitants, with eight municipalities experiencing declines of more than 10%. The largest population centres—Ponferrada (El Bierzo) and Villablino (Laciana)—saw reductions of 2,794 and 1,441 residents respectively during this period.

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Table 6. Population and unemployment in the 18 locations included in the JTA-El Bierzo-Laciana[5]

LOCATION	Population				Unemployed			
	2017	2018	2019	2020	2017	2018	2019	2020
Bembibre	9.191	8.979	8.705	8.598	885	803	726	682
Berlanga del Bierzo	366	360	360	354	30	20	23	26
Cabrillanes	779	775	759	747	30	30	27	26
Cubillos del Sil	1.859	1.839	1.816	1.768	152	149	125	135
Fabero	4.635	4.551	4.493	4.386	487	373	359	327
Folgoso de la Ribera	1.132	1.108	1.080	1.045	88	89	78	65
Igüeña	1.190	1.142	1.145	1.123	84	67	55	63
Noceda del Bierzo	692	680	672	640	47	40	38	29
Palacios del Sil	1.030	989	941	907	89	79	72	69
Paramo del Sil	1.336	1.293	1.259	1.255	130	117	124	127
PONFERRADA	65.788	65.239	64.674	64.509	6.381	5.942	5.486	5.099
San Emiliano	678	665	646	627	42	34	26	26
Toreno	3.219	3.157	3.105	3.012	320	297	252	223
Torre del Bierzo	2.157	2.162	2.164	2.114	171	152	139	133
Valdesamario	199	196	194	189	18	14	16	16
Vega de Espinareda	2.210	2.137	2.069	2.044	175	175	142	152
VILLABLINO	9.150	8.919	8.620	8.444	701	633	592	569
Villagaton	588	588	613	627	23	20	20	21
TOTAL	**106.199**	**104.779**	**103.315**	**102.389**	**9.853**	**9.034**	**8.300**	**7.788**

Analysis and insights

Employment quality and conditions

Regarding the quality and labour conditions of the new job positions and employment opportunities generated by the JTAs, the study revealed a scarce and precarious job creation. According to the interviewees, the impact of policies in labour is low, since they have serious difficulties to identify and mention projects or successful stories (interviews 3, 8, 9, 13, 14). Many of the projects are still being negotiated or initiated, therefore it is too soon for a proper assessment of the outcomes. The little employment that has been generated is in small, family businesses that do not create many jobs. Mainly, it has focused on the service sector, with low-paid salaries and unstable jobs (such as occupations in the care sector) (int 8). This contrasts sharply with mining and thermal power plant jobs, which had hard working conditions but high wages and generated a lot of wealth and complementary economic fabric. In fact, the working conditions of the miners are known to have been achieved after great efforts and years of struggle, and some people point out that they have been considered 'privileged' for this.

[5] Sources: MITECO, 2025 and INE, 2025.

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Although green projects are mentioned, there is widespread scepticism about their materialisation and the real number of jobs that this type of industry will generate, their stability and duration (they consider, for example, that the assembly of infrastructures generates employment, but temporary), or even the adequacy of the 'green' label for them (int. 10). Even though interviewees consider that social wellbeing and environmental sustainability are compatible goals, the prioritisation is clear: the generation of decent employment is above other considerations, including environmental ones, if there are security guarantees (int. 3). In general, the consulted people link the creation of decent jobs to mid or large companies in the industrial sector (int. 3, 5, 6, 8, 10, 11, 12, 13, 14). Other voices point out that current employment opportunities are not appealing for young people, due to their nature and conditions (int. 1, 6, 8, 9; FG 17). Likewise, for some individuals, access to aid (such as the option of early retirement) is more competitive than a scenario with scarce and low-quality employment.

Productive and social fabric

For this analytical area, it is important to recall the gradual decline and the poor prospects and expectations carried over from previous restructuring plans, that generated a 'false diversification'. According to the participants, the reality of the place is not reflected in public policies. Therefore, a positive impact of the JTAs on the productive and social fabric of the affected areas is hard to perceive. A considerable number of projects did not succeed or are half-finished (poorly chosen, without future viability, etc.). Even though dynamizing other sectors (tourism, agriculture and stockbreeding) can be considered as a viable option, they cannot be an alternative themselves, and most of the consulted individuals claim for the industry as the key sector, which is the one that 'creates wealth' due to its better wages and conditions. This is understood as a need for a promoting a diversified and quality industry, which would generate quality and lasting jobs over time, avoiding a new monoculture. There is a high dependence on subsidies and lack of roots, which creates a cycle of 'smoke' investments that do not generate a lasting industrial fabric or stable jobs. An unexpected benefit to be pointed out is the restoration of open-pit mines (e.g. *La Escondida*), which would improve both the environmental and economic value of this area. However, the consulted stakeholders regret that this had to be done with public funds, being actually responsibility of the companies.

The embedding of new economic projects promoted by the just transition policies faces bureaucratic problems related to the management of grants. Smaller locations lack the necessary resources to make proposals, and they suffer project continuity and timing issues (they are conceived over a period of time and then institutional aid and support ends, or they need a long implementation period). Moreover, there are hardly any territorial or trans-regional projects, which would help the growth of the area through synergetic relationships. Other factors mentioned are the geographical location, affected by the need for improvements in infrastructures (roads, railroads) and a lack of entrepreneurial attitude in the region.

Although many voices, especially representatives from trade unions, suggest as an ideal scenario the installation of medium or large companies, there is no consensus on the format to be adopted by economic alternatives (networks of micro-projects versus big projects), although there is great agreement that a 'driver project' would be a viable solution for the adverse situation. On the other hand, there is little interest or confidence in the private sector being able to boost the area, unless it is through the attraction of capital via subsidies. In addition, there is a call for greater coordination between institutions at different levels and the promotion of projects at the regional

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level that involve several localities. To generate economic activity, it makes no sense to leave the responsibility to municipalities, many of them small, against a private sector that shows a clear preference for larger and better-connected towns and cities. A constant criticism is the need to improve the monitoring and inspection tasks of projects that receive subsidies, regardless of their size, to avoid the awarding of proposals without a serious project and the 'subsidy hunters'. In general, there is no clear criticism of the policies of the Just Transition Institute, some even consider that it has acted well, but there is an undoubted agreement that it has acted late.

Adaptation of the affected communities

A major issue highlighted is the pace of the transition (int. 3, 5, 7, 6, 8, 14): Many of the participants indicate that it was 'neither transition, nor fair' (they even doubt that it can be described as 'green'). It was abrupt and lacked timely planning, with a 4-year gap between the closures of 2018 and the start of the interventions. Some declare that the closures left them in a state of 'shock', even though the closures 'were coming', even since 2010, due to the economic unsustainability of the situation. Members of the communities thought that the authorities would do something about it, as during the previous restructuring plans (int. 4, 5, 7). Reminiscent of the time of the strikes, many residents have been forced to rely on family members from previous generations, whether retired or pre-retired. The general mood of the population is very pessimistic, and the remarkable exodus suffered by this area during the last years indicates the difficulties for the population to deal with the disrupting changes. The migration patterns are not only bound to the need for an income (which also caused population movements overseas), but also to the lack of services in locations with a degrowing population, which encourages whole families, even those benefited by social protection measures, to move to bigger places. Social protection plans, although they have included measures such as early retirements and compensation, are considered insufficient, unequal and with serious social consequences that have led to the decline of the region.

This also leads to a deterioration of services and quality of life: population loss and lack of investment have led to the abandonment of rural areas, with the closure of basic services and a worsening health care and infrastructures. There is also a health impact to be mentioned: although leaving the mine is positive for long-term health, work-related health problems (respiratory problems, back problems) persist or manifest after retirement. All these factors lead to a generalised pessimism and loss of identity. In addition, early retirees are unable to engage in paid economic activity, which limits their ability to contribute to the local economy. The mining community, with a strong identity, has been fractured by the impossibility of living from its traditional sector and the lack of a viable alternative, leading to a feeling of abandonment and helplessness. Due to issues such as mining identity, the habit of having a salaried job, and the industrial spirit of the population, there are few options for recycling and professional reinvention. Many went to other mines (e.g. metals) or to carry out tunnelling tasks. It is true that there is also a 'love-hate' relationship towards the mines, since it was a monoculture, which 'gave them everything but also took everything from them' (int. 9). Although this depopulation hinders the development of the towns and the availability of labour to carry out new projects, it is important to note that the interviewees indicate that people who had to leave the mining areas would gladly return if they had a job opportunity.

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Training and requalification

Training-related strategies need to be improved according to the perception of community members about training and the update of skills. In addition to the fact that some former workers had to seek or pay for training programmes themselves, those over 35 often lacked the time to participate or struggled to balance it with their jobs. There is also a misalignment between training and employment, since training courses have been offered to former workers, but there are no companies or jobs in the area that demand those skills, making them useless for local employment. Training programmes should have started years before the closure of mining facilities and thermal power plants, giving affected groups time to adapt to the new situation. Adapting mining skills to other local sectors has been also a challenge in this context.

Moreover, people propose the promotion of Vocational Training (VT) programmes over university training as a key solution. The need for professions that are more demanded and in short supply would help to get adapted for an industrial growth. On the other hand, training for the service sector and tourism is also needed due to the absence of training facilities and programmes in these areas. In general, young people have to move to the next town or to cities to complete their training needs. Since the creation of job opportunities and economic growth was insufficient, the efforts on training and requalification would help the workers and future generations to have an income source, but not necessarily to fix population on the affected areas.

Distribution of policy impacts

There is also an uneven distribution of policy impacts throughout different collectives. The effects of the JTAs are focused on adult men (30-40 years), who were not eligible for the early retirement plans. However, because of the labour and income outcomes of the policies, more women need to incorporate to the labour market in female-dominated occupations and sectors (elderly care), which are commonly characterised by precarious conditions (int. 6, 8, 10, 15). Younger people are affected in a prospective way, since their opportunities for the future have been worsened.

Inequalities in compensation procedures were also reported. There was a clear disparity between workers in parent and subcontracted companies. The former received severance pay, while those of contractors had worse consideration in the compensation plans. For the cases of miners, it can be said that the conditions were not universally satisfactory, especially for those from private companies or more recent cohorts, who received lower compensations. Cases involving mining workers and thermal power plant workers also revealed some differences, as the former had clearer expectations of closure due to a series of restructuring plans dating back to the 1990s. In this way, some mining towns were divided between a proportion of workers (up to three quarters) who could benefit from early retirement plans and a group that could not. Worsening the situation, many miners who lost their jobs feel 'marked' when looking for work: being part of a group with many physical ailments, a higher proportion of diseases, and accustomed to fighting for their acquired rights with a combative spirit, they believe that their value in the market runs the risk of being lower.

In a geographical sense[6], there was also noticeable pattern difference between the two regions analysed, Laciana and El Bierzo, being the first one in worse conditions due to their location and

[6] The case study #9 "Climate finance and its distribution in the EU" of the GreenPaths Project (D3.4.) contributes with interesting data to the context of this unequal distribution, and the urban-rural divide.

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communications infrastructure. Although they believe that in Spain the situation in all mining areas is difficult, some of the towns are more advantaged because they are close to a seaport, a motorway or a large city. This may involve competition risks to attract capital between different just transition zones, covered by different agreements. There are also problems coming from the fact that the affected communities live in villages that are widely dispersed, with different sizes, characteristics, resources and opportunities. Since the programmes foresee the municipalities to compete for public funding, this may disadvantage some of the locations, who, despite being deeply affected, have little capacity to submit proposals. The interviewees perceive the Spanish case as relatively disadvantaged compared to other EU cases, despite not having carried out joint relations or campaigns at this level. They regret the idea that Spain had to 'be the first' to make the transition, and that they had to be 'greener than anyone else'. When asked about the comparison with other countries, the German case is the one that comes to mind first, showing a certain envy for having known how to plan better (int. 3, 9, 12, 13, 14). They consider, therefore, that in other countries the process will be worthy of being labelled as 'transition'.

Main results

To sum up, the findings are articulated by five analytical categories and can be summarised through the following main results and a summarising table (Table 7):

- **Employment:** Job creation has been scarce and precarious, mostly in low-paid service sectors. Green projects are viewed with scepticism, and decent employment is prioritised over environmental goals. Industrial jobs are seen as essential for stability and attractiveness to workers.

- **Development:** Previous restructuring led to false diversification. Current projects lack viability and continuity, with high dependence on subsidies. There is a call for medium/large industrial projects and better coordination. Infrastructure deficits and bureaucratic hurdles hinder progress.

- **Adaptation:** Transition was abrupt and poorly planned, causing shock and pessimism. Population decline, service deterioration, and health issues persist. Strong mining identity and lack of alternatives limit reinvention, leading to migration and loss of local economic activity.

- **Training:** Programmes were late and misaligned with local job demand, which, added to the fact that workers over 35 faced time constraints, made it difficult to take advantage of them. Concerning future generations, Vocational Training should be reconsidered over university education to cover the actual job demands. However, the relative lack of local facilities forces youth to migrate or commute for education.

- **Distribution:** There are unequal effects across groups—adult men being the most affected, women entering precarious jobs, youth facing bleak prospects. Compensation disparities between parent and subcontracted workers reveal the importance of job security. Geographic inequalities and competition for funding exacerbate disadvantages.

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These categories can be bound to the main **socio-environmental justice dimensions**, already explained in the Deliverable 1.2[7]. The socio-environmental justice approach emphasizes the need for equitable transitions in response to climate and environmental challenges, recognizing that justice is not only about outcomes but also about processes and identities. It is commonly framed through three interrelated dimensions: **distributional justice**, which concerns how the benefits and burdens of environmental transitions are shared across different social groups (Köhler et al., 2019; Piggot et al., 2019; Sovacool et al., 2020); **procedural justice**, which focuses on inclusive governance and decision-making processes—who participates, how, and with what influence (Cambou, 2020; Heffron & De Fontenelle, 2023; Lager et al., 2023); and **recognitional justice**, which seeks to acknowledge and respect the identities, experiences, and rights of marginalized or underrepresented communities (Juhola et al., 2022; Lempinen & Vainio, 2022; Krawchenko & Gordon, 2021). These dimensions often overlap and evolve depending on context, and scholars such as Piggot et al. (2019) and Abram et al. (2022) argue for a deeper reflection on what justice truly means in practice—highlighting that transitions should not merely compensate for losses but also renegotiate power, ownership, and cultural identity, and be responsive to diverse vulnerabilities and relational dynamics.

Moreover, the categories and corresponding findings can be linked to the processes of social impact defined in the GreenPaths Analytical Framework (deliverable 2.4)[8]: InJustice/InEquality (poverty/vulnerability): Distribution/Recognition/ Participation; Loss and Damage (non/economic: mobility, life, species/biodiversity, heritage/culture, health/well-being etc.); Labour (Production/Consumption); Mitigation/Adaptation; Recovery/Resilience/Restoration; Governance/Policies. Table 7 summarizes the findings and lists these links.

Table 7. Summary of the main findings and links to socio-environmental justice and processes of social impact

CATEGORY	MAIN FINDINGS	SOCIO-ENVIRONMENTAL JUSTICE DIMENSIONS	PROCESSES OF SOCIAL IMPACT
Employment quality and conditions	• Scarce, precarious jobs in service sector • Green projects viewed sceptically • Decent employment prioritised over environmental goals • Industrial jobs seen as key for stability	**Distributional justice:** How the benefits (decent employment) and burdens (precariousness, distrust of green projects) are distributed among workers. Concerns about job quality versus environmental objectives reflect tensions in the distribution of impacts.	Labour
Productive and social fabric	• False diversification dragged from past plans • Projects lack viability and continuity	**Procedural justice:** Problems in the planning, feasibility and monitoring of projects, as well as	Loss and damage

[7] D1.2. "Preliminary assessment of the approaches and methodologies currently used to identify, foresee and assess green transition policy interventions in Europe"

[8] D2.4. "GreenPaths Analytical Framework, Indicators and Tools, for the Implementation of WP3 Case Studies"

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CATEGORY	MAIN FINDINGS	SOCIO-ENVIRONMENTAL JUSTICE DIMENSIONS	PROCESSES OF SOCIAL IMPACT
	• Dependence on subsidies and 'smoke' investments • Need for medium/large industrial projects • Infrastructure and bureaucratic hurdles • Need for monitoring and follow-up of projects	bureaucratic obstacles. It points to failures in the processes of governance and participation, central elements of procedural justice.	
Adaptation of affected communities	• Abrupt transition, poor and late planning • Population decline and service deterioration • Persistent health issues post-mining • Strong mining identity limits reinvention • Migration and loss of local economy	**Recognitional justice:** Mining identity, social and economic deterioration, and the lack of recognition of the specific needs of communities. It reflects how certain ways of life and vulnerabilities are not adequately recognized in the transition.	Mitigation/adaptation
Training and requalification	• Late and misaligned training programs • Workers over 35 face time constraints • Need to reconsider and promote Vocational Training • Lack of local educational facilities • Youth forced to migrate for education	**Procedural + Distributional justice:** The lack of alignment and accessibility in training affects the distribution of opportunities (distributional), but it also reflects institutional decisions that exclude certain groups (procedural), such as older workers or young people without local access.	Recovery/Resilience/Restoration
Distribution of policy impacts	• Unequal effects across groups (men, women, youth) • Women in precarious jobs • Compensation disparities (parent vs subcontracted; miners vs thermal power plant workers) • Geographic inequalities and competition for funding • Spanish case seen as disadvantaged vs EU peers	**Distributional + Recognitional justice:** Inequalities between groups (gender, age, type of contract, geography), which clearly falls into distributive justice. It also implies recognition justice by making visible how certain groups (women, young people, urban-rural divide, subcontracted workers) are systematically disadvantaged.	Injustice and inequality

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In summary, the timing and planification of the green transition is a central issue. 'Neither transition nor just' is the most frequent description of the process. The green transition may be unavoidable, but it could have been done in a less 'dramatic' way. As a result, the effects of the transition processes remind us of the importance given to the physical place amidst a so-called 'digital economy', which collides with the mobility of the capital, even for the case of traditional industries. The energy and mining sectors are still constricted by the adequacy of the places where they generate jobs and wealth. However, the energy transition and the globalisation incorporate new trends that differ significantly from those that stem from the industrial revolutions. For the case of areas where coal extraction and combustion were the main source of wealth and social wellbeing, there is a pessimistic perception of their future, especially for the smaller places. Besides regret for a premature transition for which the mining areas were not ready, interviewees criticised the reproduction of mistakes from previous plans. Benefits of the just transition policies are hardly perceived, and they feel themselves 'abandoned', while negative impacts are visible and present for everyone. This leads to a lack of trust towards political authorities and companies in their responsibility for creating jobs and dynamizing the local and regional economy.

Discussion and conclusions

'Neither transition nor just'

The findings reveal an unbalanced relation between costs and benefits of the green transition policies. 'Neither transition nor just' is the central message shared by the affected individuals, regardless their role in the community. The JTAs suggest a continuation of the 90s restructuring policies already suffered by the mining sector. This means that the affected communities were already foreseeing the definitive closure of mines. However, they did not expect such a short, abrupt and traumatic process. A more structured and gradual sequence was the idea of a transition for the inhabitants of the coal-intensive regions in León.

The 'green vs brown jobs' discourse is not present when the analysis focuses on the regional levels and the affected sectors. Despite the acknowledgement of the environmental costs of mining, and the convenience of reducing the CO_2 emissions, the priority lays on the need for a convenient income source. According to the findings, the lack of economic alternatives (due to deficiencies in communication infrastructures, low private initiative, competitivity disadvantage, or the dominance for decades of a single sector), requires an ambitious, long-term and transversal intervention. The allocation and channelling of public funding is a crucial component of just transition policies; however, it is insufficient. Public actions need to bear in mind both the stakeholder map and the specific features of each area affected. These policies need to be accompanied by independent impact assessments that consider a variety of potential positive and negative effects regarding demographical aspects, educational needs, economic resources and opportunities, public services, and inequality risks, among others. An 'employment zero-impact' policy may disregard additional factors that matter for the dynamization of the economic and social fabric of a region.

Erosion of mutual trust

The feeling of pessimism and 'abandonment' increases the risks of reducing mutual trust. This translates not only into a possible rejection of just transition policies but also into a generalised move away from political institutions and social agreements based on mechanisms delivered by the structures of a sound democracy. Such a pessimistic landscape, feeding the pessimistic

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attitudes in the society, may generate a vicious circle: the negative perspectives increase the exodus, while the exodus worsens the decline of these areas.

A huge mistake would be to accept this situation as a failure and put all the efforts and resources in other forthcoming transition regions. On the one hand, because a multi-stakeholder and participative intervention may take the most of these regions; on the other hand, these communities may face a second critical moment when temporary labour solutions end, such as mine restoration activities or dismantling operations, or when plans and projects are completed. Past restructuring experiences show that simply subsidising companies often leads to their disappearance once funding stops.

Governance and policy design

One aspect to be discussed is the possibility of simplifying the design of just transition policies. Dealing with the intervention plans both at the regional and national level implies entering a whole 'labyrinth of policies'. This not only makes it difficult to understand and analyse, but for end users (whether they are companies, local administrations, workers or small entrepreneurs) it can be an added frustration and even discourage the commitment to revitalise just transition areas.

Just transition and decarbonisation policies must address socioeconomic patterns rooted in decades or even centuries of history. These patterns reflect shifts in energy markets, demographic changes, and specific work cultures, which cannot be reversed by a short-term plan. Therefore, strategies should harmonise the needs and expectations of diverse groups—workers, investors, unions, students—while integrating key elements into policy design: educational reform, local and regional diagnostics, transparent communication, ongoing monitoring, and fair responsibility sharing. Embedding participation and follow-up at the core of these policies will not only improve their effectiveness but also rebuild mutual trust, currently at risk due to poor planning and management.

In this case study, political cycles often disrupt economic and demographic revitalisation projects. Multiple administrative levels—local, regional, national—and various agencies are involved, so changes in leadership frequently lead to shifts in objectives, mechanisms, and the overall design of intervention plans. These variations are not always ideological; they often stem from different views on regional development and, at times, political or personal interests. This lack of a shared common interest underscores the need for accurate diagnoses that reflect the realities and priorities of affected communities, as the timing of the just transition remains a critical concern repeatedly highlighted by interviewees. Several projects have been cancelled following changes in the decision-makers. This makes it inevitable to rethink the distribution of responsibilities in a fair way: a long-term vision that goes beyond political cycles for national, regional, and local authorities; long-term commitments from companies; the responsibility of local communities to defend their territory and future generations, along with their civic duty to demand accountability through available channels; and, finally, the joint effort of all stakeholders to seek a realistic balance between environmental sustainability, economic development, and social well-being.

Winners and losers

In terms of ‘winners’ and ‘losers’, a complex situation arises. Companies may be considered as the most privileged subject in this process: both those entities benefitted by public financing

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during the creation of new economic opportunities, as well as the owners of companies that leave the regions without assuming major social or environmental responsibilities. They are seen as privileged actors by the communities, since they reduce their risk levels thanks to public funding, which makes the investment capital exceptionally mobile, and they use the workforce as an object of negotiation: many regions are willing to receive their investments in view of job creation. Accordingly, public authorities of candidate territories are keen to relax the entry or operating conditions for companies as much as permitted. Within the 'losers', different categories are to be identified: both among locals who remain in the place (affected by lack of opportunities, shortages and other consequences of a declining population) and those who need to move (for a job, to have medical services at hand, to provide their children educational opportunities), different levels of disadvantage can be differentiated. Transversally, those who are not contemplated in the compensation scheme are the most negatively affected by the transition policies. While the early retirement schemes offer economic support for those who could request them, they do not contribute to fixing the population in their territories nor to developing a productive fabric. This option was sometimes the 'least bad option' in sight of a declining area without better alternatives.

Solutions and lessons learned

Different solutions and demands have been suggested throughout the case study. Among them: a stronger institutional support and public engagement (which can be translated into a higher amount of funds but with an optimised allocation); broadening the coverage of the social plans (through a proper stakeholder map); increasing the efficiency of the interventions, by improving the knowledge of the affected areas and their realistic potential; supporting a SMEs ecosystem; promoting driver projects to articulate the regional development; conceive the projects with a transversal (multisector), transregional (benefitting different municipalities) and long-term approach. Several respondents pointed out that it would have been wise to declare some of the mining facilities as 'strategic reserves', in case of energy supply problems; however, since the thermal power plants are being shut down, this is no longer a realistic option.

Throughout the study, other cases like the German one, are mentioned as best practices that should have inspired the Spanish just transition policies, insisting in the need for a long-term approach with industry-based economic alternatives for the affected areas. All the lessons learned from this research could likewise warn and inspire other green transition scenarios. This can be applied for the abandonment of non-renewable energy sources: other JTAs in Spain including the closure of nuclear energy facilities, but also other decarbonisation plans, including the closure of coal mines and thermal power plants in the European Union and beyond. Nevertheless, it can also be leveraged for the timely prevention of bad practices that could be present during the implementation of 'green' energy sources (e.g. hydrogen) or during the recent increase of mining operations bound to the boost of the digital economy (e.g. data centres as job-creating solutionism) and the 'green' economy (copper, lithium, etc.).

In this regard, it is crucial to learn from the consequences that the installation of these economic infrastructures in the 19th century still has today, as they radically transformed the landscape, demographics, character, and culture of the areas where they were established. Just as the social and environmental impact of a product or service cannot be understood in isolation but must be considered within its full spatial and temporal context—where it comes from and where it goes—the closure of coal mines and thermal power plants cannot be seen as just another item on the list of green transition outcomes. They are part of a cycle, a process that spans centuries, and therefore cannot be reversed suddenly through subsidies.

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With this in mind, it is urgent to recall all the economic promises linked to 'major projects,' often attracted through incentives—affordable electricity, tax benefits, low-cost land, preferential access to infrastructure and transport—with the hope of fostering local and regional development and creating jobs. These incentives must not amount to a 'blank check' regarding environmental impact, either in the short or long term. Rather, they should depend on various aspects like hiring policies, water use, biodiversity impact, realistic permanence plans, commitments in the event of cessation of activity, transparency in communications, and a firm commitment to quality, stable employment.

The reliance on industrial monoculture has proven risky for territories—not only because its sudden disappearance can dramatically disrupt the social and economic fabric of a place, but also because it places companies in a position of power, granting them illegitimate privileges in decision-making processes. Idolising job creation as a source of wealth and using it as a 'political mantra'—reducing people to numbers—leads to power imbalances at multiple levels, condemning future generations and the territories they inhabit. This is how the 'love-hate' relationship mentioned by locals when speaking about 'the mine' is forged. The result is a complex balance between production centres, population, and territory, which calls for rethinking, planning, and exercising responsibility and foresight whenever an economic promise announces its arrival in a region.

Global market dynamics vs local vulnerabilities

Faced with the need to manage the closure of facilities and operations known to be doomed, an intriguing dilemma arises between economy and demography: Does it make sense to invest heavily in keeping people in a territory that grew disproportionately due to an industrial boom? Or does market logic suggest allowing individuals to relocate according to the needs and demands of production centres? The 'depopulation drama' is felt most acutely because of the sudden disruption experienced by affected towns—the disappearance of public services, difficulty accessing consumer goods, ageing populations—but ultimately revolves around the desirability or rejection of living in a specific place. It is not easy to determine what levels of dispersion and demographic growth are desirable for a region, as these limits depend largely on its characteristics and resources. What some perceive as a tragedy, others see as adjustments in the relationship between resources—including human resources. Who bears responsibility for all these changes, and to what extent should we intervene or let things take their course?

Today, digitalisation allows third sector companies to operate from a wide range of locations worldwide. In the tangible economy, the global mobility of capital enables companies to extract resources by choosing among different options. Thus, even if a thermal power plant and a mine are only a few dozen kilometres apart, the plant's managers can choose to burn coal imported from other continents because it is cheaper—and do so without hesitation or consequence. There is no inherent inevitability to remain tied to the *locus*: resources are anchored to the land, but companies can choose where to extract and process them. This situation is not unique to coal; renewable options such as hydrogen are already showing signs of reproducing these patterns, with the consequent risk of engaging in neo-colonial practices[9] (Müller, 2024; Venditto & Kamwanyah, 2025).

[9] https://www.greeneuropeanjournal.eu/hydrogen-green-solution-or-energy-colonialism/

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The greater flexibility of conditions and requirements often found in countries on the global periphery forces EU nations to compete with these locations. This competition can lead to deteriorating standards or, as in Spain's case, a chain of coal subsidies that delayed an inevitable end for years. Domestic coal had been uncompetitive for decades, so there was probably time to plan the closures better—but were there real options to do so? When mining areas were first exploited, capital chose those locations because that was where the mineral inevitably lay. At that time, there was no need to attract investment with incentives, and roads were not considered 'too bad' for transporting materials, as investors now claim. Today, companies have far more freedom to choose—and they will opt for whatever best serves their interests.

As interviewees insist that they feel 'abandoned' or 'helpless' whether by companies or by public authorities, this reveals one of the harshest faces of the global capitalist system. If the state stops counteracting the lack of competitiveness and ceases to act as a guarantor of well-being, communities are left to face a market that does not necessarily prioritise environmental sustainability or social justice.

Recommendations

Based on the analysis carried out, and with the help of the feedback and suggestions provided by the consulted individuals, the following recommendations can be outlined:

- **Continuous and participatory evaluation:** Placing central importance on diagnostic and participatory processes to identify viable development formats and structures, as well as a balance between sectors that are interesting, attractive, and realistic for the affected population. These processes also help identify improvements in the zoning of plans, aiming to prioritise the sustainable exploitation of endogenous resources. This implies discarding strategies that seek to establish a monoculture to 'replace' or compensate for outgoing sectors, and therefore not underestimating the power of small businesses or the potential of driver projects. Ensuring social plans cover affected parties, with a broad scope of impact.

- **Optimisation and governance:** Coordinate administrations and optimise resources at the regional level (infrastructure, industrial and natural heritage with tourism potential, industrial parks, etc.) to foster cooperation among affected communities. Avoid redundant proposals (such as having an industrial park in every town) or unnecessary competition to attract capital and projects that could create imbalances in terms of winners and losers: prioritise regional and inter-municipal proposals. Use diagnostics to promote in each location the options that generate the most opportunities. Encourage and prioritise proposals with commitments based on creating stable, high-quality jobs in the long term, beyond political cycles.

- **Imagine and connect:** Abandoning preconceived ideas about the potential of a region. Highlighting innovation and promoting it in a decentralised manner; facilitating interconnection among stakeholders for resource exchange (contacts, knowledge, ideas, training).

- **Facilitate processes:** Watching for additional difficulties arising from administrative and bureaucratic hurdles. Realistically guarantee a network of infrastructure, transport, and

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communications that enables the development of the productive fabric. All this without sacrificing or jeopardising environmental, economic, and social sustainability standards.

- **Cross-cutting and innovative training:** Making training a central component, aligned with capacities and needs, and planned for the medium and long term. Including non-formal education processes that involve different groups (not only youth and the unemployed) to unlock the potential of all individuals, also inactive populations. These training strategies should also foresee actions aimed at promoting entrepreneurship and professional retraining, breaking myths and mental or cultural barriers. In formal education, emphasising vocational training oriented toward industrial and service sectors and facilitating access to educational centres.

- **Accountability:** Making companies effectively responsible for their ecological and social footprint in the territories (through insurance, guarantees, contingency funds, etc.). Conditioning incentives on the existence of clear environmental and social sustainability plans, avoiding 'blank checks.' Conducting strict evaluations of development proposals and their commitments. Designing monitoring systems that, without discouraging investment, ensure proper use of allocated funds and a commitment to create not only jobs but also long-term well-being potential, respecting territories and host populations.

- **Understanding:** Taking into consideration the non-economic components of crises caused by these closures. Assessing, in addition to demographic impacts and service coverage, those social, psychological, cultural, and identity factors that influence not only how crises are experienced but also how people react to them. The human and social side of restructuring processes can also affect the viability and acceptance of proposed alternatives. In this regard, it is desirable to ensure transparency and communication between the territories involved and the administration (with effective figures such as the 'territorial agent') and carry out feedback processes with some frequency.

Leaving aside those cases already engaged in just transition processes and focusing especially on regions to be decarbonised or (re)developed, it is essential to highlight the urgent need to plan the transition with sufficient time and leave little room for improvisation. This calls for conducting diagnostics several years in advance before the changes occur, and designing ambitious policies, not only financially but also in terms of controlling potential intervening factors. The lessons learned from this case study can also be useful for regions that consider promoting social and economic development through a specific sector or investment, whether it be lithium mining, developing a tourist complex, or building a data centre.

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1.4 Case study 4: Assessing the Impacts of the Common Agricultural Policy (CAP) in Land Use in Slovenia, Croatia and Serbia

Overview

Land, Power, and the Uneven Geographies of Europe's Green Transition

Land is simultaneously a material resource, a social institution, and a political terrain. It anchors food systems, ecological cycles, livelihoods, identities, and cultural memory. Yet in dominant sustainability debates—particularly within EU climate and agricultural policy—land is often reduced to a technical variable: a commodity for carbon sequestration, renewable infrastructures, or biodiversity offsets. This case study, situated within the GreenPaths project, challenges such technical framings. Drawing on political ecology, critical agrarian studies, and degrowth research, it argues that land is where the core contradictions of the European green transition become visible - central to power dynamics and control of resources.

Land is not treated solely as a productive resource but as part of social reproduction, ecological continuity, territory, and identity. This framing is essential for understanding why CAP-induced land concentration and exclusion are not only economic symptoms but disruptions of deeply rooted social and ecological worlds.

Across Europe, farmland concentration has intensified. Large-scale industrial farms now control most agricultural land, while small farms—those most associated with traditional practices and rural vitality—continue to disappear (Lowder et al., 2021; Graeub et al., 2016). Between 2010 and 2020, the EU-27 lost nearly three million farms—primarily smallholdings under 5 ha—while farms over 100 ha expanded and now control more than half of all utilised agricultural areas (Eurostat, 2020; European Parliament, 2017). This trend is not unique to Western Europe; it is particularly pronounced in the Balkans, where post-socialist transitions, restitution, privatisation, and EU integration interact with CAP's area-based payment system to accelerate structural inequality and distributional injustices in the green transition (Burja et al., 2020; Borras & Franco, 2018).

Why Land Matters for Green Transitions

The *EU's Green Deal, Farm to Fork Strategy* (Omar and Thorsøe, 2023), and *Biodiversity Strategy* position land as a central lever for climate resilience. Yet the policy tools deployed—particularly within the *Common Agricultural Policy (CAP)*—often deepen the very inequalities they seek to address. CAP still distributes the majority of its funding according to hectares owned, not socio-ecological value (Pe'er et al., 2019; Guyomard et al., 2023). Critics argue that this design reproduces the historical logics of productivism, commodification, enclosure, and artificially manufactured scarcity (Calo et al., 2021; Hickel, 2021). It sidelines centuries old systems of governance of land as commons (Helfrich & Bollier, 2015) and privileges high-input, carbon-intensive farming systems over agroecology, and small-scale farming with short supply chains.

This tension is evident even in ostensibly progressive environmental goals. The new EU objective of "No Net Land Take by 2050" (Colsaet et al., 2023) aims to reduce soil sealing, yet in practice it often shifts development pressure—the demand for land for housing, logistics, transport corridors, renewable-energy installations, biodiversity offsetting, and other non-agricultural uses—onto rural and marginal territories. As urban and peri-urban areas tighten their land-use constraints, these pressures are displaced outward, accelerating farmland abandonment,

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consolidation into larger agribusiness units, or speculative acquisitions framed as environmental solutions. Such dynamics increasingly overlap with green grabbing, where land is enclosed under the banner of climate mitigation, carbon farming, biodiversity credits, or bioenergy expansion. Rather than supporting diverse rural livelihoods, these processes risk deepening inequalities and reinforcing the structural drivers of land concentration that this case study examines.

At the same time, new "green" frontiers are emerging. Carbon farming, renewable energy zoning, biodiversity offsets, and afforestation projects revalue rural land not primarily as a place of livelihood but as a site for climate mitigation and financial speculation (Avila, 2018; Apostolopoulou et al., 2021). In Croatia and Serbia, wind energy projects and conservation schemes on depopulated land illustrate how green transition policies can create new forms of green grabbing, where rural communities bear the costs of ecological "solutions" designed elsewhere. This is a contemporary reworking of the metabolic rift: socio-ecological burdens accumulate in rural peripheries, while environmental benefits and control are concentrated in urban and corporate centres (Moore, 2003; Dorninger et al., 2021). The rise of carbon farming, renewable energy zoning, conservation buffers, and rewilding initiatives can dispossess smallholders—especially in contested or marginal rural regions. This "green grabbing" reframes land as a carbon sink or biodiversity offset rather than a livelihood resource (Avila, 2018; Apostolopoulou et al., 2021; Fjeldstad et al., 2020). In the Western Balkans, such initiatives risk replicating patterns of exclusion under the banner of green transition.

Why the Balkans Matter

Slovenia, Croatia, and Serbia offer a strategically important lens. All three have undergone a triple transition: from socialist agrarian models to liberalised land markets, from war or state restructuring to EU alignment, and from cooperative to individualised property regimes. These shifts have created fertile ground for internal land grabbing, elite capture, and foreign investor acquisition (FIAN, 2013; Kušić, 2022). However, the countries also have their differences: Slovenia retains a smallholder structure but experiences consolidation through CAP and public land leasing; Croatia faced shock restructuring upon EU accession, with thousands of small farms disappearing; and Serbia, though outside the EU, mirrors CAP-driven dynamics via IPARD conditionalities and privatisation, producing some of Europe's most extreme land concentration patterns. These findings demonstrate that the social costs of the green transition are substantial: generational stagnation, land-access barriers, rising inequality, and depeasantisation. This case demonstrates that rural depopulation is both a biophysical problem and a social one.

A Degrowth and Critical Agrarian Lens

Recent degrowth scholarship emphasises that rural dispossession, depeasantisation, and land abandonment are central drivers of socio-ecological crises, yet remain marginal in urban-centric transition narratives (Varvarousis et al., 2025; Demaria et al., 2023). Critical agrarian studies similarly show how land policies reproduce race–class inequalities, metabolic rifts, and "accumulation by dispossession" (Moore 2003; Borras and Franco 2013; Borras and Franco 2025). Building on this, scholarship from Eastern and Southern Europe highlights how agrarian change in the EU's semi-periphery is shaped by intersecting dynamics of environmental justice, post-socialist transition, and CAP-driven restructuring. Work such as Oprea, Velicu et al. (2023) on "eco-agrarian citizenship" and Velicu et al. (2022) on "quiet no more" peasant mobilisations demonstrates how small-scale farmers perform alternative ecological and political imaginaries while confronting exclusionary land regimes and subsidy architectures. Together, these perspectives underline a key insight guiding this case study:

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> *A just green transition is impossible without confronting the politics of land. CAP, as currently structured, reinforces socio-spatial inequality rather than transforming it.*

This case study thus positions land concentration—across Slovenia, Croatia, and Serbia—as both a symptom and a driver of uneven green transitions in Europe's semi-periphery, and as a critical focus for the GreenPaths project's broader goals of justice-oriented sustainability.

Research questions

The GreenPaths project asks how green transition policies affect social wellbeing, environmental sustainability and territorial equity, and which "systemic contradictions or unintended consequences" they generate. This case study answers that central question by focusing on land as a key terrain where the EU's green transition is being implemented, contested, and unequal.
The overarching research question guiding the case is:

> *How does the Common Agricultural Policy (CAP) contribute to the transformation of land use patterns, agricultural practices and rural livelihoods of small farmers in Slovenia, Croatia and Serbia?*

This question is situated in a post-socialist "*triple transition*" context of socialist agrarian reform, market liberalisation and EU integration, where CAP's and area-based direct payments interact with already fragile and unequal agrarian structures - spatial inequalities and dimensions of distributional injustice (Burja et al., 2020; Medarov, 2013; Swinnen, 2009; FIAN, 2019). While the European Green Deal and Farm to Fork strategy claim to foster sustainability and rural renewal, CAP still predominantly rewards hectares rather than need, thereby reproducing land inequalities (Pe'er et al., 2019; Guy et al., 2017; Guyomard et al., 2023).

Guiding and Empirical Questions

To unpack the main question and link it explicitly to GreenPaths' primary research questions on social impacts, environmental outcomes and land justice, the study is structured around two guiding questions and three empirical sub-questions:

I. *To what extent does CAP contribute to land concentration, and what socio-economic and environmental consequences follow for small farms and rural communities in the European semi-periphery?*

Existing evidence shows that area-based payments "overwhelmingly benefited larger and more professionalised operations" (Guth et al., 2020), driving land price inflation and land grabbing (European Parliament, 2017). In Slovenia, farms over 20 ha—around 6% of all farms—received 40% of subsidies in 2016, while the smallest 50% received only 13% (Agency for Agricultural Markets and Rural Development, 2016). Similar patterns are visible in Croatia and Serbia, where corporate actors such as Agrokor/Fortenova and Al Dahra have consolidated tens of thousands of hectares (Srećković, 2013; Gluščević & Katić, 2019; Kušić & Eberle, 2025).

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II. *How do different stages of EU accession and CAP alignment shape land-use change and agrarian restructuring in Slovenia (EU-15+), Croatia (recent member) and Serbia (candidate country)?*

The "anticipatory" effects of CAP and IPARD in Serbia, and the abrupt restructuring post-accession in Croatia, provide a gradient of integration through which to analyse policy linkages and territorial inequalities (Bilewicz et al., 2022; Burja et al., 2020). These are operationalised through three empirical sub-questions:

- EQ1 – Land-use and ecological change: How have land use and agricultural practices (crop patterns, intensity, abandonment, afforestation) changed since CAP accession/alignment, and with what consequences for soil, biodiversity and agroecological practices?
- EQ2 – Distribution, access and exclusion: Who benefits from CAP and CAP-like subsidies, and how do these mechanisms contribute to land concentration, "internal land grabbing" via leasing, rural depopulation and the marginalisation of smallholders, women and young farmers?
- EQ3 – Alternatives and just transition pathways: What viable alternatives to the current model of direct payments exist—such as cooperative farming, commons-based land governance and agroecology—and how might they support more equitable and ecologically sustainable systems aligned with degrowth and territorial justice principles?

Variables and Social Impacts

To answer these questions, the case study investigates five key variables that link directly to GreenPaths' focus on social and environmental trade-offs:

- Land use patterns (monocultures, abandonment, afforestation, agroecological practices)
- Land access and tenure (public land leasing, informal tenure, price dynamics)
- Farm size and land concentration (polarisation, emergence of large agribusiness holdings)
- Ownership structures (state, corporate, family, oligarchic, foreign)
- Subsidy distribution (by size, region, and actor type)

Across these variables, the case study examines social impacts through the lens of the GreenPaths analytical framework. The core impacts correspond to key social impact processes:

- Distributional inequality: rising intra-rural inequality, polarisation of farm structures, and unequal subsidy capture.
- Recognition and representation: the marginalisation of smallholders, women, youth, and informal land users from CAP decision-making and national land governance debates.
- Procedural justice: barriers to entry, opaque land markets, and exclusionary institutional designs that favour capitalised actors.
- Vulnerability and precarity: rural exodus, depeasantisation, and the intergenerational crisis produced by shrinking access to secure land and viable livelihoods.
- Agency, collective capacity, and alternatives: how farmers, tenants, and grassroots organisations navigate and contest these dynamics, including emerging agroecological and commons-based initiatives.

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These impacts reflect broader ecological tensions in a green transition that, rather than repairing the metabolic rift between society and nature, often deepens it through consolidation, financialisation, and technocratic "green" interventions (Moore, 2003; Calo et al., 2021; Franco & Borras, 2013). Situating the case within this framework clarifies how land concentration and CAP-driven dynamics shape uneven transitions in Slovenia, Croatia, and Serbia.

Methods

This study employs a comparative tri-national and interdisciplinary methodological approach grounded in critical agrarian studies, political ecology, environmental justice, and degrowth research to analyse how the CAP reshapes land use, land access, and rural livelihoods in Slovenia, Croatia, and Serbia. Building on Kušić's (2022) argument that human–soil relations in Southeast Europe are historically and existentially embedded in processes of displacement, restitution, and ecological dependency. Land is not treated solely as a productive resource but as part of social reproduction, ecological continuity, territory, and identity. This framing is essential for understanding why CAP-induced land concentration and exclusion are not only economic symptoms but disruptions of deeply rooted social and ecological worlds.

Conceptual and Analytical Framework

The methodological approach integrates three major pillars of scholarship:

I. Critical Agrarian Studies (CAS)

The case study draws on Critical Agrarian Studies (CAS) to analyse how land relations, property regimes, and state policies shape rural inequality and environmental outcomes. Building on Borras, Franco, and van der Ploeg, CAS highlights contested land authority, hybrid property systems, and the agency of smallholders. Insights from Colsaet et al. on "No Net Land Take," Calo et al. on property regimes, and Srećković on post-socialist land grabbing illuminate emerging enclosures in the EU semi-periphery. Malek & Verburg inform the analysis of land-use decision-making, while Pe'er and Frelih Larsen et al. contextualise CAP's environmental and distributive effects.

II. Political Ecology of Land and Human–Soil Relations

Political ecology conceptualises land as embedded in power relations among states, capital, and communities (Fairbairn 2020; Bunkus and Theesfeld 2018). Kušić (2022) expands this perspective by showing how soil in Southeast Europe carries memory, loss, labour, and belonging. This view informs the study's attention to how CAP reshapes not just land markets but the lived materialities of farming and the social reproduction of rural life.

III. Degrowth, Commons, and Environmental Justice

Degrowth scholarship (Kallis 2018; D'Alisa et al. 2014; Barlow 2022) highlights alternative farming futures based on sufficiency, care, autonomy, and socio-ecological resilience. The commons and environmental justice frameworks developed by the Institute for Political Ecology

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(IPE 2018; IPE 2020) inform the study's socio-environmental justice-oriented evaluation of land governance, emphasising democratic access, procedural fairness, and community control. Environmental justice perspectives help clarify who bears the costs and who benefits from these land transformations.

Global Land Politics and Land Grabbing as Analytical Orientation

The methodological orientation is further strengthened by global land politics and land-grabbing scholarship. Franco et al. (2013) conceptualise land grabbing as a reconfiguration of political authority and control over land through state–corporate alliances, while Yang and He (2023) identify structural drivers such as commodification, enclosure, and financialisation. Borras and Franco (2025) frames land relations as dynamic, negotiated and multi-sited. Although the Balkan cases examined here involve primarily internal, policy-mediated land grabbing—through area-based subsidies, leasing regimes, and administrative decisions—rather than large-scale transnational acquisitions, the analytical insights of global land politics help reveal how CAP reproduces structural inequalities and facilitates elite capture.

Comparative Tri-National Research Design

The study compares Slovenia (EU member since 2004), Croatia (EU member since 2013), and Serbia (EU candidate shaped by IPARD conditionalities). This captures both direct CAP effects and anticipatory Europeanisation, revealing how EU rural policy logics reshape agrarian systems at different levels of integration. The design also reflects the post-socialist "triple transition" of socialist agrarian reform, market liberalisation, and EU accession.

Data Sources and Empirical Materials

Policy and legal analysis

The analysis draws on a comprehensive review of EU-level and national policy documents that govern agricultural subsidies, land markets, and rural development in Slovenia, Croatia, and Serbia. At the EU level, key instruments include the Treaty on the Functioning of the European Union (Arts. 38–44), CAP Regulations 1307/2013, 2021/2115, and 2021/2116, the European Parliament Resolution on Farmland Concentration (2017), as well as the broader sustainability architecture of the European Green Deal, Farm to Fork Strategy, EU Biodiversity Strategy for 2030, and the EU Soil Strategy for 2030. These frameworks define the subsidy architecture, eco-scheme requirements, cross-compliance standards, and financial management rules that structure land use and agricultural production in the region.

Nationally, the study examines Slovenia's Farmland and Forest Fund Act (ZSKZ) and Agricultural Land Act; Croatia's Law on Agricultural Land (2018, amended 2022) and its CAP Strategic Plan 2023–2027; and Serbia's Law on Agricultural Land (2006, amended 2015), the Privatisation Law, and the IPARD II Programme 2014–2020 governing pre-accession rural development support. These documents were analysed to assess how EU-level priorities are translated into domestic law, and how state land is leased and allocated.

The analysis also considers international soft-law frameworks such as the UN Declaration on the Rights of Peasants (UNDROP) and the FAO Voluntary Guidelines on the Responsible Governance of Tenure (VGGT). Together, these sources illuminate how subsidy rules, property legislation, land-leasing mechanisms, and compliance systems interact to define who gains or

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loses access to land—and how policy contradictions contribute to land concentration, exclusion, and uneven green transition outcomes.

a) Secondary Data Gathering: Quantitative indicators

Eurostat (Farm Structure Survey; Economic Accounts for Agriculture), World Bank, and national datasets are used to analyse land use, farm structure, subsidy concentration, agricultural employment, and ecological indicators (soil, grassland protection, biodiversity).

b) Primary Data Collection: Semi-Structured Interviews

Five semi-structured interviews in Slovenia provided qualitative insight into policy implementation, land governance, and rural experiences. Interviewees included:

- an official from the Ministry of Agriculture,
- a representative from the Ministry of Natural Resources and Spatial Planning,
- Dr. Dora Matejak, researcher of organic farming governance and rural social reproduction,
- Dr. Katarina Kušić, political ecologist specialising in land, sovereignty, and human–soil relations in the South-East Europe,
- Maja Prijatelj Videmšek, environmental journalist covering biodiversity, food systems, and rural livelihoods for the national newspaper Delo.

Sampling was purposive, targeting key institutional, academic, and media perspectives on land and CAP. The semi-structured guide focused on land-access barriers, CAP implementation, subsidy distribution, environmental conditionalities, gendered and generational dynamics, and emerging alternatives (commons, agroecology). Transcripts were coded thematically, combining deductive codes (derived from the GreenPaths framework and research questions) with inductive codes emerging from the material. Interview data were then used to interpret statistical patterns and policy documents, offering triangulation between quantitative trends, formal governance narratives, and everyday rural realities.

Findings and results

Europe's Uneven Landscape of Land Concentration

Across the EU, land is where agricultural policy, market forces, and green transition ambitions collide. Farmland concentration has accelerated over the past decade, with small farms disappearing at scale and land increasingly controlled by a shrinking minority of large holdings. Between 2010 and 2020, the EU-27 lost nearly three million farms—primarily smallholdings under 5 ha—while farms over 100 ha expanded and now control more than half of all utilised agricultural areas (Eurostat, 2020; European Parliament, 2017). This is not an accidental trend. It reflects structural incentives embedded in the CAP), which—despite green transition rhetoric—still distributes most of its budget through area-based payments that reward those who already possess land. Scholars argue that these mechanisms create a "protected space for agricultural entrepreneurs" (van der Ploeg et al., 2015; Kay et al., 2015), enabling the accumulation of land by commercial actors and agrobusiness conglomerates.

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In Eastern and Southeastern Europe, these dynamics intersect with post-socialist property transformations, restitution, and weak regulatory governance, creating "hybrid land regimes" where socialist legacies coexist with financialised, investor-driven land markets (Franco and Borras, 2013). Slovenia, Croatia, and Serbia—countries shaped by the triple transition of socialist agrarian governance, neoliberal restructuring, and EU integration—illustrate how CAP-aligned instruments reshape land use, ownership, and the socio-ecological fabric of rural areas (Kušić, 2022).

Land Use Transitions: Ecological Change and Structural Adjustment

Agricultural Land Dynamics

Agricultural land share has declined in the EU-27 from 48.3% in 1990 to 40.7% in 2022 (World Bank, 2022), reflecting broader withdrawal from marginal farming, environmental conditionality, and structural adjustment. Slovenia maintains stable shares around 30% (World Bank, 2022), due to multifunctional landscapes and limited opportunities for large-scale consolidation (Bojnec & Latruffe, 2007). Croatia expanded agricultural land post-2000 but contracted sharply after EU accession in 2013 (World Bank, 2022), mirroring accession-related structural shocks (Burja et al., 2020). Serbia retains high levels (≈39–41%) (World Bank, 2022), reflecting a production-oriented model shaped by commodity markets rather than EU conditionality (Srećković, 2013). This divergence illustrates how CAP membership reorganises land use, encouraging extensification, set-aside, and—critically—concentration in competitive zones while accelerating abandonment elsewhere (Pe'er et al., 2019).

Crop Patterns and Intensification

Cereal land—the backbone of industrial agriculture—fell sharply in the EU after decoupling, from 58.2 million ha (2000) to 51.5 million ha (2022) (World Bank, 2022). Croatia followed this pattern: cereal land contracted after accession (2013), undermining small cereal producers unable to meet new standards (Burja et al., 2020). Slovenia remained stable due to mixed-farming traditions (Udovč, 2003). Serbia, by contrast, sustains more than 1.7 million ha of cereals, reflecting an agrarian model shaped by commodity markets rather than environmental conditionality (Srećković, 2013).

Forest Expansion and Abandonment

Forest cover increased across all three countries. While often framed as ecological recovery, this trend also signals labour loss, rural depopulation, and the retreat of smallholder farming (Domazet et al., 2017; Burja et al., 2020; European Parliament, 2017). Afforestation under CAP Pillar II provides incentives but rarely addresses underlying socio-economic decline (Erjavec & Erjavec, 2015).

Collapse of Agricultural Employment

The decline in agricultural employment is profound between 2000–2022 (World Bank, 2022): Slovenia: 9.6% → 4.3%, Croatia: 16.5% → 5.9%, Serbia: 26.7% → 19.5%. This labour exodus is not neutral: it reflects a structural shift toward capital-intensive, land-intensive, labour-saving

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models, often supported by CAP subsidies. In the Balkans, this trend is tied to the erosion of peasant economies, youth outmigration, and the hollowing out of rural infrastructures.

Land Access and Property Regimes: Winners and the Excluded

Across Slovenia, Croatia, and Serbia, land access is increasingly shaped by property regimes that privilege capital-intensive actors, marginalise smallholders, and channel subsidies or state assets toward those best positioned to navigate administrative and political systems.

In Slovenia, the agrarian landscape appears dominated by smallholders—around 70% of farms remain under 5 ha, a legacy of socialist-era farm size limitations (Centrih and Sitar, 2022). Yet beneath this surface of fragmentation lies a pervasive trend towards consolidation. The Farmland and Forest Fund, responsible for managing restituted and state-owned land, increasingly leases larger parcels to corporate actors able to satisfy bureaucratic criteria and investment requirements (e.g., Court of Audit, 2018). Dr. Matejak stressed how paperwork requirements effectively "filter out those without administrative capacity."

CAP patterns expose this structural bias: in 2016, farms over 20 ha—only 6% of all farms—received 40% of total CAP subsidies, while half of all farms (under 5 ha) received only 13%. Large agri-food firms such as Perutnina Ptuj, Panvita, and KG Lendava captured more than €80 million in CAP funds between 2011 and 2022. Although Slovenia's protective land laws slow outright land sales, they do not counter the financialisation of land embedded in CAP's area-based payments (Kay et al., 2015).

In Croatia, post-accession restructuring produced a more overtly politicised land regime. Between 2008 and 2018, more than 50,000 small farms disappeared (Josipović, 2021), while access to state-owned land became a site of political patronage. Leasing tenders frequently privileged well-connected agribusinesses, and CAP funds were entangled in scandals involving fraud, falsified livestock records, and manipulated land registries (Telegram.hr, 2023). Corporate conglomerates such as Agrokor/Fortenova expanded their holdings through debt-leveraged acquisitions and preferential access to state land (Domazet et al., 2022).

Here, CAP's area-based logic accelerated land consolidation, enabling land to function as collateral or speculative capital, particularly in cereal and dairy sectors (Burja et al., 2020). Smallholders often face exclusion through administrative complexity, lack of legal assistance, and competition with capitalised actors (Franco & Borras, 2013), resulting in a starkly dual agrarian structure: modernised, subsidy-rich agribusiness on one end, shrinking and marginalised family farms on the other.

Serbia, although outside the CAP, mirrors these dynamics even more sharply due to rapid, opaque privatisation following the fall of Milošević. Large tracts of state and cooperative land were transferred to oligarchs and foreign investors through legal loopholes, weak oversight, and corruption—conditions partly shaped by donor-driven privatisation frameworks (Srećković, 2013). A parallel pattern of resource capture is also seen in Romania's forest commons (Velicu, 2025). By the mid-2010s, four major landowners controlled more than 100,000 ha—exceeding the territory of several municipalities (Gulan, 2010). The PKB Belgrade privatisation transferred 17,000 ha to Al Dahra (UAE) under highly controversial conditions (Kušić, 2022). Foreign investors commonly used shell companies to circumvent ownership restrictions (Srećković, 2013). Although Serbia is not a CAP member, pre-accession alignment through IPARD funding reinforces these dynamics by rewarding land size and capital intensity rather than social need or rural viability (Burja et al., 2020). Dr. Kušić emphasised that privatisation "created a class of agro-oligarchs who now shape rural space." She described PKB's privatisation as a turning point showing how international investors exploit weak regulation.

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Together, these cases reveal a shared regional pattern: property regimes—shaped by restitution, privatisation, EU policy alignment, and financialisation—systematically generate winners and losers. Large agribusinesses and politically connected investors consolidate land control, while smallholders, tenants, youth, and women face increasing exclusion from both land markets and subsidy systems.

Farm Structure and Concentration

A convergent pattern of agrarian dual structure is visible across all three countries. In Slovenia, consolidation is intensifying despite the persistence of small average farm sizes: the largest 6% of farms now cultivate roughly one-third of national agricultural land (Agency for Agricultural Markets, 2016). Corporate actors dominate investment measures, modernisation schemes, and eco-schemes—interventions that, as shown by Erjavec et al. (2021), remain largely inaccessible to smallholders. Interviewees repeatedly highlighted the dual structure emerging: small farms remain many; large farms control most land and subsidies: "We look like a smallholder country, but the real power lies with a few big actors." (Videmšek Prijatelj 2024) Similar dynamics are amplified in Croatia, where EU accession accelerated the restructuring of the sector: mixed family farms exited, while large agribusinesses expanded cereal, oilseed, and dairy production (Burja et al., 2020), and access to state land emerged as the decisive bottleneck for new entrants. Serbia exhibits the most unequal configuration, with a majority of farms below 5 ha coexisting with million-euro agroholdings and foreign capital controlling extensive estates (Srećković, 2013). Taken together, these trajectories reveal a region-wide shift toward top-heavy agrarian capitalism, where a small cluster of large landholders and vertically integrated firms increasingly shape food systems, while thousands of small farms struggle for viability or exit agriculture entirely.

CAP Subsidy Distribution: Structural Drivers of Inequality

Area-Based Payments as a Mechanism of Power

The Basic Income Support for Sustainability (BISS) rewards hectares, not livelihoods (Pe'er et al., 2017). This design produces several predictable effects: speculative leasing (Guyomard et al., 2023), land price inflation (European Parliament, 2017), and the transfer of subsidies to landowners rather than active farmers (Erjavec & Erjavec, 2015). It also contributes to the exclusion of young and women farmers, who typically hold smaller plots, lack capital to lease or purchase large areas, and face administrative and land-market barriers that make it difficult to accumulate eligible hectares (Burandt & Mölders, 2017). This regressive mechanism shapes land-access dynamics across all three countries. Also stressed by dr. Matejak that area-based payments shape land markets

Coupled Payments and Ecological Trade-Offs

Coupled payments for livestock reinforce: high-input, intensive production, increased stocking densities, feed dependence, soil erosion, greenhouse gas emissions (Guyomard et al., 2023; Pe'er et al., 2019). These incentives undermine ecological goals and further consolidate power among large, technologically advanced farms.

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Limited Environmental Effectiveness

Despite its expanded "green architecture," the CAP has delivered only marginal ecological improvements. Fewer than 5% of hectares under greening requirements resulted in any substantive change in management practices (European Commission, 2020). Cross-compliance standards remain weak, often symbolic, while biodiversity indices continue to decline (EEA, 2015). Soil degradation and agricultural emissions persist or worsen (Fetting, 2020; Guyomard et al., 2023; Pe'er et al., 2019). The core issue is structural: environmental measures are layered onto a fundamentally productivist subsidy regime, producing internal contradictions in which financial incentives reward expansion and intensification, undermining the very ecological goals they are meant to support (Erjavec and Erjavec, 2015).

Emerging Green Grabs

The rise of carbon farming, renewable energy zoning, conservation buffers, and rewilding initiatives can dispossess smallholders—especially in contested or marginal rural regions. This "green grabbing" reframes land as a carbon sink or biodiversity offset rather than a livelihood resource (Avila, 2018; Apostolopoulou et al., 2021; Fjeldstad et al., 2020). In the Western Balkans, such initiatives risk replicating patterns of exclusion under the banner of green transition.

Social Impacts: Depeasantisation, Inequality, and Rural Decline

The social consequences of CAP-driven restructuring across Slovenia, Croatia, and Serbia reflect deepening distributional and recognitional injustices, particularly for smallholders, women, and young people. Land concentration, mechanisation, and subsidy capitalisation contribute to a growing rural exodus, the ageing of farming populations, and the abandonment of marginal land (Burja et al., 2020; Domazet et al., 2017). This ongoing depeasantisation represents not only a socio-economic contraction but also a cultural loss, eroding rural identities and traditional ecological knowledge.

These trends are reinforced by intersectional inequalities. Women farmers hold significantly less land, have more limited access to credit and cooperatives, and are often excluded from leasing systems and investment measures (Burandt & Mölders, 2017; ECVC, 2021). Even when CAP includes nominal gender-support schemes, patriarchal inheritance norms and property regimes restrict women's effective access to land and subsidies—an example of persistent recognitional injustice within agrarian policy.

Young farmers face similar structural barriers. Inflation of land prices through subsidy capitalisation (European Parliament, 2017), capture of state land by incumbents and politically connected actors (Kay et al., 2015), and high co-financing thresholds for investment programmes (Guyomard et al., 2023) all contribute to entry denial. This blocks generational renewal and limits the emergence of new, more sustainable farming models.

Together, these social impacts illustrate how CAP's current design contributes to marginalisation of smallholders, rural depopulation, and elite capture of land governance, while only minimally enabling the community-led or cooperative alternatives emerging at the margins.

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Public Perception: Support Mixed With Disappointment

Eurobarometer 556 (2024) shows high support for CAP across the EU. Croatia perceives CAP positively—especially for food security and rural development. Slovenia reports significantly lower satisfaction with environmental outcomes and adequacy of payments. A majority of Slovenians according to the Eurobarometer believe subsidies are insufficient, reflecting structural vulnerability of small mountainous farms. Perception data illustrates that citizens recognise CAP's importance, but also sense its uneven distribution of benefits. (Eurobarometer 556, 2024). Public officials from the Ministries noted public perception often reflects "structural precarity of mountain and small farms."

Main results

Across Slovenia, Croatia and Serbia, the case study shows that the green transition—mediated through the CAP and CAP-aligned instruments—produces partial environmental improvements, yet simultaneously deepens land concentration, rural social inequality and socio-ecological disruption. These patterns reflect broader European trends but are intensified in post-socialist agrarian systems shaped by restitution, privatisation and hybrid property regimes (Franco and Borras, 2013; Kušić, 2022; Bilewicz et al., 2022).

Interview data played a central role in interpreting these dynamics. Officials confirmed the limited effectiveness of eco-schemes and the persistence of productivist incentives; researchers highlighted gendered and generational barriers to land access; and journalists and practitioners described lived experiences of administrative exclusion, elite capture of state land, and the erosion of smallholder viability. These qualitative insights triangulate the quantitative and policy analysis, revealing how structural processes are felt on the ground and how CAP's design translates into everyday constraints, unequal opportunities, and uneven rural futures.

Structural Drivers of Land Concentration and Unequal Development

The principal finding is that area-based direct payments—the central mechanism of CAP Pillar I—reinforce land concentration and consolidate power among large actors, echoing earlier research on "protected spaces for agricultural entrepreneurs" (van der Ploeg et al., 2015; Kay et al., 2015). In all three countries, land becomes a financial asset rather than a socio-ecological commons, aligning with global observations of land financialisation and policy-mediated land grabbing (Franco et al., 2013; Yang and He, 2023; TNI 2015).

In Slovenia, consolidation is hidden beneath a smallholder landscape, but CAP payments, leasing practices of the Farmland and Forest Fund, and investment subsidies favour larger vertically integrated firms (Udovč, 2003; Bojnec and Latruffe, 2005). In Croatia, post-accession restructuring accelerated the disappearance of over 50,000 small farms, as state land leasing and CAP compliance created opportunities for political–corporate capture (Josipović, 2021; Domazet et al., 2022). In Serbia, privatisation and IPARD alignment enabled oligarchic and foreign control over vast estates—illustrating a distinct form of policy-enabled internal land grabbing (Srećković, 2013; Kušić, 2022; Gulan, 2010). These findings demonstrate that the social costs of the green transition are substantial: generational stagnation, land-access barriers, rising inequality, and depeasantisation.

Environmental Outcomes: Limited Gains, Persistent Contradictions

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While the CAP's green architecture (eco-schemes, greening, cross-compliance) provides some environmental benefits, such as stabilisation of grasslands, afforestation and modest uptake of organic practices (Erjavec and Erjavec, 2015; European Commission, 2020), overall ecological outcomes remain weak. Research across Europe shows <5% of land under greening experienced meaningful management change (Pe'er et al., 2019), biodiversity indicators continue to decline (EEA 2015), and high-input, livestock-intensive models remain subsidised through coupled payments (Guyomard et al., 2023). In Croatia and Serbia, land abandonment contributes to wildfire risk and human–large carnivore conflict (Domazet et al., 2017).

The case study confirms that environmental measures layered onto a productivist subsidy regime generate contradictions: green transition objectives coexist with incentives for monocultures, mechanisation and capital-intensive farming (Fetting 2020; Kallis 2018).

Social Justice Dimensions: Exclusion, Gender Inequality and Territorial Decline

The findings highlight major justice gaps: Rural depopulation and labour loss: agricultural employment collapsed across all three countries, reflecting structural adjustment and the erosion of peasant economies (World Bank, 2022; Swinnen, 2009). Across the region, CAP-related dynamics reproduce intersectional inequalities that disproportionately affect women, youth, and smallholders. Gendered injustices persist as women hold significantly less land, face inheritance and credit barriers, and capture fewer benefits from area-based subsidies (Burandt & Mölders, 2017; ECVC, 2021). Youth exclusion follows a similar pattern: inflated land prices through subsidy capitalisation, restricted access to state land, and high co-financing thresholds systematically block generational renewal (European Parliament, 2017; Bunkus & Theesfeld, 2018). At the same time, commons-based and community alternatives—cooperatives, food-sovereignty networks, and local agroecology—remain marginal due to limited policy recognition and support (IPE, 2018; Liegey & Nelson, 2020; D'Alisa et al., 2014). Together, these dynamics illustrate how recognitional injustice intersects with structural barriers, reinforcing unequal access to land, subsidies, and opportunities within the green transition.

Benefits: Stability, Infrastructure and Environmental Potential

Despite these inequalities, the CAP does provide important benefits: income stabilisation for mid-sized and larger farms, rural infrastructure and diversification projects under Pillar II, partial support for organic farming, agroforestry and landscape conservation, improved environmental governance capacity in Slovenia and Croatia, strong public recognition of CAP's contribution to food security (Eurobarometer 556, 2024).

The green transition in the region delivers limited ecological gains but significant social and distributive costs, reinforcing structural inequalities while failing to address core sustainability challenges. Without redistributive land governance, needs-based support, and meaningful backing for commons-based and agroecological systems, the EU's green transition risks deepening rather than resolving ecological and social injustices in Southeast Europe.

Discussion and conclusions

This case study set out to understand how CAP and CAP-aligned policies shape land use, land access, and rural livelihoods in Slovenia, Croatia, and Serbia – and what this reveals about the environmental and social consequences of the EU's green transition. The findings confirm much of the critical agrarian and political ecology literature on land concentration and subsidy

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inequality, but they also bring new nuance from Southeast Europe's post-socialist "triple transition". They show how green transition policies, when layered onto liberalised land markets and fragmented institutions, reproduce patterns of dispossession, depeasantisation, and ecological degradation rather than resolving them (Bunkus & Theesfeld, 2018; Burja et al., 2020; FIAN, 2019).

CAP, land concentration and post-socialist legacies

Across all three countries, CAP's area-based payments and related instruments emerge as a central driver of land concentration and agrarian dualisation. In Slovenia, formal farm structures still appear "smallholder dominated", but the distribution of subsidies reveals a different picture: a small minority of larger farms and agro-food corporations capture a disproportionate share of CAP funds, while the majority of small farms survive on marginal payments (Udovč, 2003; Agency for Agricultural Markets, 2016). In Croatia, post-war privatisation, state land leasing, and EU accession reforms opened space for rapid agribusiness expansion and rural financialisation, epitomised by the rise and crisis of Agrokor/Fortenova as a systemically important rural actor (Domazet et al., 2022). Serbia, outside the CAP but influenced by IPARD and wider Europeanisation, demonstrates an extreme form of "internal land grabbing": vast areas of former socially owned land were privatised in opaque ways, benefiting oligarchs and foreign investors, with the PKB–Al Dahra deal (17,000 ha) symbolising the dispossession of public agrarian assets (Srećković, 2013; Gluščević & Katić, 2019; Kušić & Eberle, 2025). In all three cases, land liberalisation and subsidy capitalisation generate a structural advantage for those who already control land, capital, and political connections.

These patterns resonate strongly with global land politics and land grabbing scholarship, which conceptualises enclosure not only as a historical process but as an ongoing dynamic of "accumulation by dispossession" through laws, markets, and policy incentives (Gómez-Baggethun, 2015; Franco & Borras, 2013; Harvey, 2003). In Southeast Europe, CAP and CAP-like instruments do not create land grabbing; rather, they amplify and stabilise a trajectory where land is increasingly treated as an asset, collateral, or financial vehicle, and less as a commons, livelihood, or socio-ecological relation.

Depeasantisation, rural shrinkage and degrowth spatial politics

The empirical findings also echo what Varvarousis et al. (2025) call the neglected "rural front" of degrowth spatial politics. While much degrowth discourse has shifted towards cities, this case confirms that core drivers of socio-spatial inequality – depeasantisation, rural abandonment, land concentration, and the transformation of peripheries into sacrifice zones – are central to understanding the green transition in Europe's semi-periphery.

In Slovenia, Croatia, and Serbia, agricultural employment declines sharply while agricultural land either consolidates in competitive lowlands or is abandoned in marginal territories. Forest expansion and land abandonment are often framed as ecological successes, but interview data and secondary literature show that they also reflect labour loss, rural depopulation, and the erosion of smallholder agroecologies (Domazet et al., 2017; Burja et al., 2020). Building on Varvarousis et al. (2025), this case demonstrates that rural depopulation is both a biophysical problem (biodiversity loss, altered hydrological cycles, increased fire risk) and a social one (loss of situated knowledge, worsening service access, ageing populations, gendered outmigration).

Degrowth spatial politics provide a critical lens to interpret these patterns. Rather than treating rural decline as an unfortunate side-effect of "necessary structural adjustment", they reveal it as an outcome of growth-centred territorial logics that subordinate rural regions to extractive urban

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and agribusiness interests (Savini, 2021; Varvarousis et al., 2025). CAP and national policies, by prioritising competitiveness, productivity and export orientation, reinforce this subordination: the most fertile territories are turned into intensive production zones, while marginal areas are left to "shrink smartly" or become arenas for green grabbing and speculative conservation.

Commodification, green grabbing and metabolic rifts

The case also speaks to the literature on commodification, commodity frontiers, and metabolic rift (Gómez-Baggethun, 2015; Moore, 2003; Conde and Walter, 2015; Hickel, 2021). CAP's architecture extends a long historical process in which land and nature are enclosed, commodified, and reorganised around short-term extraction rather than long-term reciprocity. From this perspective, area-based direct payments function as contemporary instruments of enclosure: they convert access to public funds into a function of land ownership, strengthening private claims over what were once commons, social property, or state assets. Hickel (2021) reminds us that the original enclosures in Europe created artificial scarcity by cutting people off from land and commons, forcing them to sell their labour and intensify productivity. A similar dynamic is at play in Southeast Europe's CAP-mediated land transformations. Smallholders who lose access to land or cannot compete for subsidies are pushed out of farming or into precarious niches; those who retain land often face pressure to intensify, specialise, and integrate into commodity chains, deepening ecological degradation and dependency.

Environmental justice, gender, and intergenerational inequality

Environmental justice perspectives help clarify who bears the costs and who benefits from these land transformations. As Anguelovski (2015) argues, environmental justice is about the right to remain in one's place and environment, protected from uncontrolled investment, pollution, speculation, and abandonment. The case study shows that for many smallholders and rural residents in Slovenia, Croatia, and Serbia, this right is increasingly undermined by policies and market dynamics that privilege large-scale, capital-intensive actors. Gendered and intergenerational inequalities are central to this picture. Women are overrepresented in small-scale, diversified, and agroecological farming but underrepresented among landowners and subsidy recipients (Burandt & Mölders, 2017; ECVC, 2021). Young farmers face inflated land prices, lack of access to state land, and high co-financing requirements for investment measures, making entry into agriculture extremely difficult (European Parliament, 2017; Guyomard et al., 2023). In practice, CAP's nominal support instruments for young farmers and women are undermined by structural barriers embedded in property regimes, inheritance norms, and local power structures.

From an environmental justice standpoint, the green transition in these countries is not simply uneven – it is actively reproducing hierarchies of class, gender, and territory. While ecological rhetoric emphasises soil protection, biodiversity, and climate mitigation, the material benefits of CAP and related policies accrue disproportionately to those already integrated into global value chains, while those who maintain more labour-intensive, biodiverse, or subsistence-oriented practices are marginalised.

Alternatives, resistance and commons-based pathways

Yet the case does not only document dispossession and decline; it also points to alternative pathways. Degrowth, food sovereignty, and commons scholarship emphasise that land struggles

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are not only defensive but also prefigurative: they create spaces of experimentation with post-growth, commons-based, and agroecological futures (D'Alisa et al., 2015; Demaria et al., 2015; Helfrich & Bollier, 2015; Barlow et al., 2022).

In Southeast Europe, resistance takes multiple forms: opposition to scandalous privatisations and land deals; campaigns against soil sealing and highway projects; community-supported agriculture initiatives; local seed-exchange networks; and attempts to reclaim or re-common public land. These initiatives remain fragmented and often marginal in policy terms, but they embody what Barlow et al. (2022) call "small ruptures" that can open strategic horizons— from campaigns for more redistributive CAP payments (e.g. higher support for the first 20 ha) to broader alliances with climate justice and urban movements.

The degrowth literature on back-to-the-landers and eco-communities (Calvário & Otero, 2015; Cattaneo, 2015) is helpful here. While romanticising rural return would be naive, these experiences show how urban–rural movements can challenge the commodification of land, experiment with low-impact livelihoods, and reweave social ties. In Slovenia, Croatia, and Serbia, back-to-the-land and agroecological initiatives are still fragile, but they demonstrate that rural territories can be sites of socio-ecological innovation rather than mere sacrifice zones. Reclaiming land as a commons—legally, institutionally, or through practice—becomes a strategic axis for degrowth-oriented transitions.

What this case brings to GreenPaths

For the GreenPaths project, the case offers several key insights about how green transition policies impact environmental sustainability and social wellbeing, and how these impacts can be assessed. First, it shows that land is a critical missing dimension in many green transition debates. CAP and associated policies reorganise land use, ownership, and rural livelihoods in ways that directly affect biodiversity, soil health, climate emissions, and food systems. Ignoring land politics risks misreading "green" policies as neutral or beneficial when they may be deepening structural inequalities and ecological rifts. Second, it highlights the importance of spatial and territorial analysis. Comparing Slovenia, Croatia, and Serbia demonstrates that the same policy logic (area-based payments, competitiveness, export orientation) produces differentiated outcomes depending on property legacies, institutional capacity, and stage of EU integration. Territorial justice requires understanding these differences, not assuming a homogeneous EU rural space. Third, it underscores the need for new indicators of green transition impacts. Conventional CAP performance metrics—hectarage under eco-schemes, farm income support, basic environmental compliance—are inadequate for capturing justice outcomes. Fourth, it demonstrates that policy coherence is currently weak. The European Green Deal, Farm to Fork, and the Biodiversity Strategy articulate ambitious ecological goals, yet CAP's dominant instruments remain structurally productivist and regressive. In the context of post-socialist land regimes, this incoherence is magnified: environmental ambitions are grafted onto systems that still prioritise export-led growth, investor confidence, and fiscal discipline over social and territorial equity.

Conclusion

In sum, this case study shows that in Slovenia, Croatia, and Serbia, green transition policies centred on CAP do not automatically produce greener or fairer rural landscapes. Instead, when combined with post-socialist legacies of restitution, privatisation, and weak governance, they often reinforce land concentration, accelerate depeasantisation, and open new frontiers for commodification and green grabbing.

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At the same time, the region hosts vibrant, if precarious, practices of resistance, commoning, and agroecological experimentation that prefigure alternative futures. For GreenPaths, a just green transition in Europe must take land politics seriously: who owns, controls, and works the land; under what conditions; and according to which social and ecological values. Without confronting these questions, the promise of a "green" CAP risks becoming another chapter in a much longer history of enclosure and extractivism—only this time, painted green.

Recommendations

The case studies of Slovenia, Croatia, and Serbia show that land concentration is not a side effect but a structural outcome of current CAP and green transition policies. To support socially just and ecologically meaningful transitions, the following recommendations outline key directions for policy reform, governance, and social mobilisation—aligned with the aims of GreenPaths. The case suggests that GreenPaths should incorporate indicators on:

- land concentration and access (including state land leasing and informal tenure),
- the distribution of subsidies by farm size, gender, age and actor type,
- rural depopulation and service decline,
- biodiversity and soil health linked to farming practices,
- the presence of commons-based or cooperative land initiatives.

Principles for Policy Reform: Equity, Transparency, and Territorial Justice

A just green transition requires reforms grounded in the recognition of land as a socio-ecological commons, not merely a factor of production.

- Prioritise equity and redistribution, directing support to smallholders, women, and young farmers.
- Improve transparency through public registers of land ownership, leases, and subsidy beneficiaries.
- Ensure participatory governance, giving rural communities influence over land-use decisions.
- Promote territorial coherence, aligning CAP with biodiversity, soil, and climate objectives to avoid contradictory incentives.

Redistributive and Regenerative Alternatives to Land Concentration

To counter land consolidation and dispossession:

- Introduce payment caps and degressive payments to curb subsidy capture by large holdings.
- Establish public land banks and trusts prioritising agroecology, small farms, and young entrants.
- Expand commons-based governance, including cooperatives, community-supported agriculture, and eco-communities.
- Shift from area-based to needs- and care-based payments, recognising labour, biodiversity stewardship, and social reproduction.

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- Implement safeguards against green grabbing in renewable energy and carbon offset schemes.

These measures strengthen rural resilience while reducing extractive pressures.

Integrating Post-Growth Metrics into CAP and Land Policy

Green transition strategies must move beyond productivist indicators:

- Adopt justice-based metrics (land access, tenure security, distributional fairness).
- Use agroecological indicators of soil health, biodiversity, and metabolic repair.
- Track gendered and generational inequalities in land access and subsidy support.
- Implement post-growth metrics (sufficiency, local provisioning, reduced material throughput).

This case identifies the need for a new indicator framework that measures wellbeing and ecological integrity, not competitiveness.

Strengthening Governance and Multi-Level Coordination

Institutional weaknesses exacerbate land inequality:

- Introduce anti-corruption safeguards in land leasing and subsidy allocation.
- Strengthen municipal capacity for fair and transparent land-use planning.
- Improve alignment between CAP, soil restoration, biodiversity targets, and no-net-land-take regulations.
- Enhance EU–national–local coordination to avoid fragmented or contradictory policies.

Robust institutions are essential for implementing equitable land transitions.

Strategic Openings for Social Movements and Cross-Border Solidarity

Structural change also depends on collective action:

- Support food sovereignty, agroecology, and land justice networks.
- Build cross-border Balkan alliances against land grabbing and rural exclusion.
- Strengthen community-led monitoring, including land observatories and investigative journalism.
- Foster degrowth-aligned rural revitalisation, linking urban and rural movements through solidarity economies.

These alliances broaden the political space for democratic, territorialised, and regenerative transitions.

Finally, it points towards pathways for a more just green transition. These include:

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- redistributive CAP reforms (e.g. stronger capping, degressive payments, much higher support for small and medium farms),
- transparent and democratic governance of public land,
- strengthening of agroecological, cooperative, and commons-based farming,
- protection of smallholders, women, and young farmers as key actors of socio-ecological resilience,
- and strategic alliances between rural movements, degrowth networks, and climate justice actors.

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1.5 Case study 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective

Overview

Latin America faces a crucial challenge: ensuring long-term economic and social development while adopting policies to address the climate crisis. After decades of neoliberal dominance and reliance on global value chains, the region stands at a critical juncture where the global energy transition could either deepen existing marginalisation or foster real structural change. Green industrial policy (GIP) can be a strategic tool for addressing this challenge. Drawing on recent policy developments and debates across the region, the paper argues that Latin America needs a fresh perspective, an ecological neodevelopmentalist consensus, tailored to the 21st-century realities of deglobalisation, the energy transition, and multipolar geopolitical competition.

For genuinely green industrial policy to succeed in Latin America, it must address four key dimensions: respecting planetary boundaries while enabling development; achieving transformation at unprecedented speed and scale; mobilising financing to bridge the substantial climate finance gap; and facilitating international cooperation, especially South-South solidarity, given the failures of Global North-led multilateral institutions. This paper outlines six pillars for a progressive green industrial policy agenda: pragmatic regional collaboration around targeted productive chains; strengthened state capacity; shifting natural resource sectors from rent extraction to innovation ecosystems; strategic neoindustrialisation connecting sectors with frontier technologies; intentional green industrialisation in renewable energy and clean technology manufacturing; and building broad social legitimacy through holistic approaches that explicitly connect productive transformation with welfare enhancement and a just transition.

The stakes could not be higher. Without structural change, Latin America risks either ongoing stagnation or a return to dependent primary-export models under a green rhetoric. Through coordinated efforts, the region has unique advantages—extensive renewable energy potential, critical mineral reserves, existing industrial capacities, and biodiversity—to advance sovereign and sustainable development. The challenge is whether political will, institutional capacity, and social mobilisation can come together to unlock this potential before climate tipping points shut down transformative opportunities.

Research Questions

This case study addresses several critical questions: Can green industrial policy break Latin America's dependency patterns in the global economy, or does it risk reproducing unequal exchange under new environmental guises? How can the region move beyond green colonialism toward genuine South-South cooperation and equitable technology transfer? What institutional reforms are necessary to operationalise a progressive green industrial agenda grounded in democratic participation and social legitimacy? How do geopolitical interests of China, the United States, and the European Union shape regional decarbonisation possibilities and constrain policy options?

Methods

Based on comparative political economy analysis, this study examines recent developments in several Latin American economies and regional policy initiatives. The research combines secondary source analysis of policy documents, academic literature, and institutional reports with insights from collaborative knowledge production involving researchers, social activists, and government officials across the region. The analysis incorporates perspectives from workers'

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organisations, indigenous communities, and civil society engaged in debates on green transformation.

This case study focuses on renewable energy transitions, critical mineral extraction, and sectoral industrial policy initiatives, with particular attention to the lithium triangle (Argentina, Bolivia, Chile) and digital economy development. The analysis draws from workshops, forums, and seminars organised across Rio de Janeiro, Mexico City, Bogotá, and Montevideo between October 2024 and October 2025, incorporating diverse perspectives from Latin American scholars, policymakers, labour leaders, and practitioners engaged in green economic transformation. This collaborative knowledge-production approach ensures that policy recommendations reflect both academic expertise and the ground-level realities of workers and communities affected by industrial policy decisions.

Findings and Results

The Latin American Context: Recent Initiatives and Structural Challenges

Globally, the orthodox neoliberal idea that markets alone can efficiently allocate resources to green technologies has proven insufficient, both in theory and in practice. The climate crisis signifies a systemic failure that requires coordinated state action to address technological lock-in, infrastructure gaps, and the substantial financing needed for a swift green transformation (Lebdioui, 2024). Nevertheless, state intervention by itself is not enough without democratic governance, regional cooperation, and a clear focus on distributional outcomes and territorial justice.

In this context, three prominent external actors influence Latin America's prospects for a green transition: China, both a significant investor in extractive sectors and increasingly involved in renewable energy infrastructure; the United States, pursuing friendshoring and nearshoring strategies to shift supply chains away from Chinese dominance; and the European Union, promoting its Green Deal with unclear implications for Latin American partners, who fluctuate between cooperation and what critics term green colonialism (Hamouchene and Sandwell, 2024). The risk of green reprimarisation—where Latin America becomes merely a supplier of critical minerals and clean energy for reindustrialisation in the Global North—looms large. The lithium triangle exemplifies these tensions: despite holding massive lithium reserves, Argentina, Bolivia, and Chile have struggled to move beyond raw-material exports towards battery manufacturing and higher-value-added production (Sanchez-Lopez, 2023). Water-intensive extraction processes have created what environmental activists call sacrifice zones (Juskus, 2023), impacting indigenous communities, while revenues flow primarily to transnational corporations rather than financing local development.

Nevertheless, the region also features successful examples of government-led green transitions. Uruguay shifted its electricity mix from 35% fossil fuels in 2007 to 98% renewables by 2024 through coordinated public investment and strategic planning, leading to annual savings of hundreds of millions of euros in energy imports (Earth.org, 2025). Costa Rica relies almost entirely on renewable electricity generation (Climate Action Tracker, 2024). Brazil's Nova Indústria plan represents an ambitious effort to connect decarbonisation with industrial upgrading policies (Reis Maria et al., 2025).

Understanding Latin America's current predicament requires examining the structural break that occurred around 1980, marking the exhaustion of import-substitution industrialisation and the rise of neoliberal orthodoxy. Productivity data reveal two sharply differing historical phases. Between 1950 and 1980, during the developmentalist era—despite its limitations—productivity in major Latin American economies grew at 2.8% annually, maintaining pace with or occasionally surpassing U.S. productivity gains and thereby narrowing relative gaps (Kulfas and Schapiro, 2025). Brazil, Mexico, and Argentina experienced sustained productivity growth, developing diversified industrial structures encompassing steel, petrochemicals, automobiles, machinery, and consumer durables.

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The post-1980 period shows a markedly different pattern. Regional productivity growth in Latin America declined to nearly zero from 1980 to 2019, even as other parts of the world continued to grow. This decline in productivity signals a premature deindustrialisation (Palma, 2025), characterised by the shrinking share of manufacturing in employment and output. In Argentina, manufacturing employment peaked in the mid-1970s before declining; in Brazil and Mexico, the share of manufacturing in GDP has stagnated or decreased since the 1980s, despite substantial population growth. Chile offers an apparent counterexample that is still coherent with the broader regional trend. After experiencing slower productivity growth during the import-substitution era, Chile experienced strong productivity growth from the 1990s onwards following radical neoliberal reforms. However, growth mainly relied on intensive extraction of natural resources—copper mining, forestry, salmon farming, and fruit exports—with relatively limited progress in manufacturing (Landerretche et al., 2024).

The productivity crisis directly intersects with environmental challenges. Structural transformation towards higher productive complexity correlates strongly with reduced greenhouse gas emission intensity. Economies specialised in primary commodities and energy-intensive basic manufacturing tend to have higher emissions per unit of GDP, creating a dual trap of low productivity and high carbon intensity (Ahumada and Sossdorf, 2025). Breaking this trap requires coordinated industrial and environmental policies—precisely what green industrial policy aims to achieve.

Traditional economic justifications for industrial policy rely on market failure theory: governments are expected to intervene when markets fail to produce efficient outcomes due to externalities, public goods, information asymmetries, or coordination problems. From this perspective, environmental policy addresses negative externalities (pollution, emissions) through measures such as carbon taxes or cap-and-trade systems that internalise these costs into market prices. Industrial policy, separately, may target coordination failures in the development of new industries.

This framework proves fundamentally inadequate for understanding the imperative of ecological transformation. Climate change and broader environmental crises are not merely isolated market failures but are indicative of systemic failures driven by the growth logic of capital accumulation, technological lock-in within carbon-intensive systems, institutional structures that prioritise short-term profits over long-term sustainability, and infrastructural commitments embodying decades of high-carbon development (Mazzucato, 2025). Addressing these systemic failures requires shifting from merely correcting market failures to actively shaping markets and creating new economic spaces that align with collective goals.

GIP has been defined as all government measures that seek to accelerate structural change toward a resource-efficient and low-carbon economy while enabling productivity improvements (Altenburg and Rodrik, 2017). This understanding includes traditional tools—subsidies, procurement, tariffs, regulations—but employs them strategically for transformation rather than merely optimisation within existing frameworks. Instead of simply adjusting price signals, GIP actively promotes new industries, technologies, and productive capabilities that advance ecological sustainability while also creating jobs, boosting productivity, and improving living standards.

Several recent GIP initiatives, such as Brazil's Nova Indústria Brasil (Ministério da Fazenda, 2024) and Mexico's Plan México (Gobierno de México, 2025), adopt a mission-oriented framework (Mazzucato, 2018). From a critical political economy perspective, mission-oriented GIP represents a partial recuperation of planning capacities within capitalism, attempting to subordinate at least some investment decisions to social goals rather than purely private profit maximisation. However, its effectiveness depends critically on state capacity, class power relations, and whether missions genuinely reflect popular needs or merely greenwash accumulation strategies. The mission-oriented framework creates space for progressive intervention but guarantees nothing about outcomes.

A key feature of GIP (when the adjective green genuinely reflects ecological concerns) compared to conventional industrial policy is its explicit recognition of planetary boundaries as strict limits

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on development. This concept emphasises nine critical Earth system processes: climate change, biodiversity loss, biogeochemical flows (nitrogen and phosphorus), land system change, freshwater use, atmospheric aerosol loading, ocean acidification, stratospheric ozone layer depletion, and emerging chemicals and plastics (Rockström et al., 2009). Each process has boundaries or tipping points beyond which Earth's resilience could be catastrophically compromised.

For Latin America, incorporating planetary boundaries into development strategy means recognising that not all growth pathways remain viable even if economically profitable in conventional terms. The Amazon rainforest, for instance, approaches potential tipping points where deforestation and climate change could trigger an irreversible transition to savanna, with catastrophic implications for regional climate, biodiversity, and indigenous peoples. Similarly, lithium and copper extraction in arid ecosystems can breach local water system boundaries, creating permanent damage regardless of mining revenues.

Nevertheless, the region's vast remaining biodiversity, substantial renewable energy potential, relatively lower historical emissions, and younger infrastructure (less locked into carbon-intensive configurations) create opportunities for leapfrogging to sustainable systems if properly harnessed. Costa Rica and Uruguay demonstrate that high-renewable electricity systems are achievable: Costa Rica generates 98% renewable electricity primarily from hydroelectric, geothermal, and wind sources, while Uruguay transitioned from 35% fossil fuels in 2007 to practically 100% renewables by 2024 (Climate Action Tracker, 2024; U.S. International Trade Administration, 2024).

Ecological transformation faces unparalleled urgency. The green transition is the first transformation in history required to be achieved within a specific timeframe (Schmitz, 2015). This temporal necessity creates intense tensions in Latin America. Conventional development strategies typically take decades: import-substitution industrialisation took place over many years; East Asian catch-up, although faster, still spanned 30-50 years across different nations. However, climate scientists warn that transformations must be largely completed within 20-30 years to prevent catastrophic outcomes.

The financing challenge is especially significant. The Climate Policy Initiative estimates that current global climate finance flows are approximately €1.3 trillion annually, but achieving the targets of the Paris Agreement requires increasing this fivefold to €6.4 trillion each year from 2024 to 2030 (CPI, 2024). Specifically for Latin America, CEPAL estimates that the region needs roughly €175-260 billion annually in climate investment—much higher than current levels and accounting for 3-5% of the region's GDP (ECLAC, 2023). Where will these resources originate from? Public budgets face significant pressure from fiscal constraints, high debt levels, and political opposition to taxation. Private capital demands risk-adjusted returns that often conflict with green investments. International climate finance from North to South, repeatedly promised since the 1992 Rio Summit and most recently at COP30 in Brazil, has never been delivered at the promised scale and often arrives as loans rather than grants. Influential political economists like Daniela Gabor and Ndongo Samba Sylla (2023) have criticised the dominant derisking paradigm for privatising gains while socialising losses, using public funds mainly to secure returns for capitalist investors in the Global North rather than directly funding the transformation itself.

The urgency of climate change calls for unprecedented international cooperation. Atmospheric greenhouse gas concentrations reflect total global emissions. While essential, unilateral national efforts are insufficient without coordination. The current climate policy framework, based on the Paris Agreement, perpetuates unequal power relations: countries of the Global North, which have historically emitted more and possess greater financial and technological resources, avoid binding commitments to climate finance and technology transfer, while countries of the Global South face pressure to reduce emissions despite having minimal historical responsibility and urgent development needs (Estevez and Riofrancos, 2025). What Latin America and other regions of the Global South require is substantial resource flows from North to South as reparations, not loans or market-based mechanisms.

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Multilateral institutions have consistently failed to deliver climate justice. Ongoing negotiations still fall far short of what the Global South needs. The promised €100 billion per year in climate finance—first pledged at Copenhagen in 2009 and only superficially met in 2022—remains critically insufficient. The new collective quantified goal on climate finance, under negotiation at COP30, risks repeating the same patterns: finance is mainly provided as loans rather than grants, and technology transfer is still dependent on restrictive intellectual property protections. The structural asymmetries in policy space—where developed countries deploy industrial policies with little regard for WTO rules or the developmental demands of Global South countries, while the Global South remains constrained by bilateral investment treaties and restrictive intellectual property regimes—have prompted renewed calls for a new international economic order for the twenty-first century (Ahumada and Chang, 2025).

The current global scenario underscores the need for South-South cooperation as an alternative solidarity framework. Latin America, Africa, and Asia must coordinate to enhance their collective bargaining power, share technologies and best practices, and establish alternative financing mechanisms that are not dominated by Global North institutions. For Latin America, South-South cooperation implies coordinated strategies: regional integration around green value chains (for instance, connecting the lithium triangle with Brazilian industrial capacity), collective bargaining in international negotiations, joint financing mechanisms through regional development banks, technology sharing and collaborative R&D, and harmonised regulatory frameworks to prevent races to the bottom. These strategies face significant obstacles—political instability, ideological divergences, and external powers' divide-and-conquer tactics—yet remain the most promising route for moving beyond dependent development patterns (Estevez and Riofrancos, 2025).

The Nova Indústria Brasil (NIB) plan, launched in January 2024 under President Lula da Silva's third administration, represents Latin America's most ambitious recent industrial policy initiative explicitly linking productive transformation with ecological objectives. NIB adopts a mission-oriented framework organising policy around six significant societal challenges: Sustainable and Digital Agro-industrial Chains, aiming to add value to agricultural complexes while reducing environmental footprints through precision agriculture and biotechnology; Resilient Health Economic-Industrial Complex, seeking to reduce dependence on pharmaceutical and medical equipment imports exposed during COVID-19; Sustainable Infrastructure, Sanitation, Housing, and Mobility, concentrating on urban transformation through electric and low-emission public transport, sustainable construction materials, sanitation systems, and renewable energy integration in social housing; Bioeconomy, Decarbonisation, and Energy Transition and Security, representing the most directly environmental mission, focusing on biofuels, hydrogen economy, renewable energy equipment manufacturing, decarbonising hard-to-abate sectors like steel and cement, and biodiversity-based innovations; Digital Transformation of Industry, promoting automation, digitalisation, and artificial intelligence across manufacturing; and Technologies for Sovereignty and National Defence, covering autonomous technological capacities in aerospace, cybersecurity, and dual-use technologies.

Each mission includes specific targets, indicators, and timelines, with yearly reviews—unlike earlier Brazilian industrial policies, which were criticised for vague objectives. NIB's institutional structure comprises an inter-ministerial council, sectoral chambers bringing together government, business, labour, and research institutions, and technical support from ABDI and other specialised agencies. NIB also stresses conditionalities—linking benefits to performance standards. Firms receiving support must meet targets for domestic content, employment creation, technology advancement, sustainability indicators, and regional distribution. This conditionality approach, drawing on Mazzucato and Rodrik's (2023) work, seeks to ensure public resources deliver public benefits rather than simply subsidising business-as-usual. However, enforcing conditionalities remains a significant implementation challenge: previous Brazilian policies included formal conditionalities often waived in practice due to lobbying, monitoring difficulties, or political pressures.

While Brazil and Mexico develop new industrial policies, two much smaller economies—Uruguay and Costa Rica—have achieved remarkable renewable energy transitions, offering important lessons for the region and other Global South countries. Uruguay transformed its

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electricity matrix from 35% fossil fuels (primarily imported oil and gas) in 2007 to 98% renewables by 2024 through state-led investment and strategic public-private coordination (U.S. International Trade Administration, 2024). The national utility UTE maintained strategic control while partnering with private renewable energy developers, particularly in wind power, which expanded dramatically alongside existing hydroelectric capacity and biomass cogeneration from forestry and sugar industries. This transition generated multiple benefits: €435 million in annual savings on energy import costs; enhanced energy security and reduced vulnerability to fossil fuel price volatility; positioning Uruguay as an electricity exporter to Argentina and Brazil; and emissions reductions, making it one of the cleanest electricity systems globally.

Uruguay's transition involved deliberate leadership from the public sector. UTE retained planning authority, managed transmission systems, and addressed integration challenges arising from variable renewable sources. However, a closer analysis reveals creeping privatisation: private actors now control assets in renewable capacity, and there is further pressure to privatise wind, solar, and biomass generation (Chavez, 2024). Costa Rica presents a similar case, with 98% of electricity generated from renewable sources: 76% hydroelectric, 11% wind, 11% geothermal, and increasing solar capacity (Low Carbon Power, 2025). The national utility ICE and its subsidiaries played a central role, combining public investment with an increasingly diverse set of sources to maintain reliability. Costa Rica's Generation Expansion Plan 2022-2040 projects adding 2,125 MW of renewable capacity, including 1,100 MW of solar and 502 MW of wind, to reduce dependence on hydroelectric power and sustain its leadership in clean energy (Climate Action Tracker, 2024).

Despite their advances, neither Uruguay nor Costa Rica has substantially industrialised around renewable energy: they consume clean electricity but import wind turbines, solar panels, and related equipment. This limitation represents a missed opportunity for technology development and value chain integration that more robust industrial policies could address.

If Uruguay and Costa Rica exemplify successful green transitions, the lithium triangle—Argentina, Bolivia, and Chile—illustrates the risks of green extractivism and the failures of resource-based development. These three countries together hold approximately 56% of global lithium reserves, concentrated in high-altitude salt flats (*salares*) of the Atacama Desert and Andean highlands (Sanchez-Lopez, 2023). Lithium's centrality to battery technologies for electric vehicles and energy storage positions this region as critical to the global energy transition.

Lithium production remains primarily focused on raw material exports with little domestic value addition. The region supplies lithium carbonate and lithium hydroxide to Asian manufacturers—mainly Chinese, Japanese, and South Korean firms—who dominate battery manufacturing and capture most of the value chain profits. Employment generation is minimal: fewer than 5,000 workers across the entire triangle despite significant investment (Sanchez-Lopez, 2023). Technology transfer has been limited, with extraction and processing techniques mostly imported. Attempts at industrial policies requiring domestic processing or battery production have repeatedly failed to challenge established international supply chain structures.

Environmental and social costs are severe. Lithium extraction consumes enormous amounts of water (up to 500,000 litres per ton of lithium carbonate) in some of the world's most arid ecosystems, threatening fragile wetlands and indigenous water sources (WEF, 2023). In the Atacama Desert, lithium operations consume 65% of the water in certain areas. Indigenous Andean communities report contamination of local water sources, land appropriations without adequate compensation, and disruption of ancestral practices (Sanchez-Lopez, 2023). The lithium triangle exemplifies the dynamics of the resource curse and neoextractivism (Svampa, 2019; Gudynas, 2016). Resource abundance, rather than enabling development, becomes a source of conflict, environmental degradation, and dependence within global value chains. Rents primarily accrue to transnational corporations, while costs—environmental, social, and opportunity costs of foregone alternative development paths—are borne by local communities and future generations.

Comparative institutional analyses indicate that state capacity, rather than resource endowment, determines developmental outcomes from lithium and other minerals (Nem Singh, 2024).

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Successful resource-based development requires capable state institutions that can negotiate favourable terms with international capital, enforce conditions, capture sufficient rents, channel revenues into productive investment, manage environmental impacts, and ensure social benefits. Recent initiatives show promise but are still in early stages. Chile's new lithium national strategy (2023) boosts state involvement and environmental standards. However, changing entrenched extractive practices faces strong opposition from incumbent companies and aligned domestic elites.

Geopolitical Dimensions: China, the United States, and the European Union

The modern international landscape differs significantly from the era of globalisation between 1990 and 2020. That period, characterised by rapid growth in trade, deep integration of global value chains, China's emergence as the world factory, and the U.S. maintaining open trading systems, has transitioned into a new phase distinguished by great power rivalry, supply chain reconfigurations and political realignments, rising protectionism driven by green and security concerns, and the crucial role of the energy transition in reshaping the world economy. Three factors drive modern deglobalisation trends. First, the distributional effects of hyper-globalisation within developed economies—such as stagnant wages, deindustrialisation, and regional decline—sparked political backlash from Trump's 2016 election campaign through to Brexit and European populism. Second, U.S.-China strategic rivalry escalated as American elites recognised China's rise as a challenge to U.S. technological and geopolitical dominance, prompting efforts to curb Chinese advancement. Third, the pandemic revealed supply chain weaknesses, as reliance on Chinese manufacturing left nations unable to secure essential medical supplies, prompting calls for reshoring and friendshoring. This context significantly influences Latin American prospects as the region is now targeted by rival powers seeking resources and geopolitical influence.

China's engagement with Latin America has evolved through distinct phases: initial commodity imports (1990s-2000s) that drove the super-cycle but reinforced primary-export specialisation; infrastructure investment (2010s) through tied lending with limited technology transfer; and currently, strategic investment in critical minerals and renewable energy. Chinese companies now dominate lithium extraction in the triangle and invest heavily in solar and wind farms, positioning China to secure inputs for its energy transition while potentially locking Latin America into roles as raw-material suppliers.

China's engagement reveals contradictions. Chinese finance provides alternatives to Western-dominated institutions and infrastructure financing when Northern countries contribute little. Nevertheless, Chinese engagement often relies on extractive models: Latin America exports commodities while importing manufactures, with rising trade deficits in non-commodity sectors. Chinese lending entails high interest rates and collateral requirements that have contributed to debt difficulties in some countries, while environmental and labour standards at Chinese-funded projects typically fall below international norms. Furthermore, China's energy transition strategy seeks to lead in clean technology manufacturing and exports. China already produces over 70% of solar panels, 60% of wind turbines, 70% of battery cells, and most electric vehicles worldwide. This trend raises concerns about fostering new dependencies: if Latin America supplies lithium and other critical minerals to Chinese battery manufacturers, who then sell batteries within the region, the economic value gained locally remains minimal while China maintains dominance over the strategic technology.

However, China's model demonstrates the potential of state-led industrial transformation. China achieved the most significant poverty reduction in history, developed advanced industrial ecosystems across multiple sectors, and currently leads in various clean technologies, all while doing so through active state planning, subsidies, technology policies, and strategic trade management—all industrial policy tools that neoliberal orthodoxy claimed would fail. This example challenges neoliberal narratives and offers inspiration for Latin American industrial policy advocates. A progressive approach requires leveraging Chinese engagement for diversification while insisting on technology transfer, environmental standards, and support for

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domestic industrialisation—maintaining autonomy rather than replacing one dependency with another.

The United States pursues supply chain reconfiguration away from Chinese dependence through *friendshoring* (relocating production to allied countries) and *nearshoring* (bringing production geographically closer, particularly to Mexico and Central America). This strategy responds to concerns about vulnerability to Chinese supply disruptions revealed during COVID-19 and strategic competition imperatives to limit China's technological advancement and economic leverage. The Inflation Reduction Act illustrates this approach, allocating €321 billion in clean energy subsidies with North American content requirements, creating incentives for firms to shift manufacturing to Mexico. The CHIPS Act subsidises semiconductor manufacturing, with conditions that prioritise U.S. and allied production.

For Latin America, especially Mexico, nearshoring presents significant opportunities given proximity, USMCA provisions, and existing manufacturing capacity. However, concerns temper this optimism. Much nearshoring may involve low-value-added assembly (*maquilisation*) with limited technology transfer, similar to patterns since the 1960s. Without an active industrial policy that enforces technology transfer and local content requirements, Mexico risks becoming a low-wage assembly hub rather than an integrated industrial economy. A progressive strategy should harness nearshoring prospects through active industrial policies that set conditions for foreign investors: technology transfer requirements, local content mandates, training and R&D obligations, and environmental standards. It should insist on reciprocity: if the U.S. limits market access for national security reasons, Latin American countries should similarly prioritise domestic development.

Across the Atlantic, the European Union progresses with its European Green Deal (EGD), targeting net-zero emissions by 2050 and setting interim goals for 2030 that demand swift changes across energy, transport, industry, buildings, and agriculture. The EGD draws substantial public and private investment for decarbonisation, positioning the EU as a climate leader. For Latin America, the EGD and related policy packages offer both opportunities and risks. On the opportunity side, the EU could be a significant market for green products. However, many researchers have identified patterns of green colonialism in EU strategy (Hamouchene and Sandwell, 2024).

Two dynamics warrant concern: First, regulatory imperialism involves the EU unilaterally imposing environmental and social standards on trade partners through market access conditions. The proposed Carbon Border Adjustment Mechanism (CBAM) imposes carbon tariffs on imports based on embedded emissions, disadvantaging Latin American producers unless they adopt EU-approved production methods. While ostensibly environmental, CBAM protects European industries from competition while limiting policy options for countries in the Global South. Second, resource extraction for the EU's energy transition involves increasing Latin American exports of critical minerals such as lithium, copper, and nickel, as well as clean energy commodities like green hydrogen and biofuels, to European markets without accompanying support for technology transfer or industrial upgrading. The EU uses trade agreements to secure the supply of critical raw materials for its green transition (Müller et al., 2024), continuing colonial-era patterns in which Latin America supplies raw materials to European industry.

A progressive Latin American approach towards the EU should leverage European market demand and sustainability standards as opportunities to upgrade production and stand out from competitors with lower standards, while opposing asymmetric rules that burden Global South countries. It should mandate that European climate finance be grants rather than loans, be untied from European procurement, and take historical responsibility into account. It should insist on technology transfer and joint R&D as prerequisites for market access agreements, and challenge double standards where the EU demands sacrifices from Global South countries but refuses to make them itself.

Given the limitations and contradictions in engagement with all three major global powers, Latin America should emphasise South-South cooperation and strategic autonomy. Several elements are crucial: BRICS+ provides opportunities for South-South cooperation in trade, finance, and

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technology, offering an institutional space not dominated by Global North interests. The New Development Bank offers alternative development financing, although still on a modest scale. Regional integration focused on specific chains shows greater potential than broad trade liberalisation, which has produced limited outcomes. Examples include pragmatic integration centred on green value chains, such as the connection between lithium producers, Brazilian industrial capacity, and regional markets.

Coordinated critical mineral strategies are essential. Latin America collectively holds dominant positions: 56% of global lithium reserves, 50% of global copper reserves, 38% of global silver reserves, and significant shares of other critical minerals. Strategic coordination in extraction, processing, and export policies could increase leverage over pricing and terms, similar to OPEC for oil. A Critical Minerals Producers Alliance, including Latin American and African countries, could negotiate collectively with consumer countries, demanding technology transfer, development of processing capacity, and fair pricing. South-South technology transfer, in which countries share successful technologies while protecting intellectual property, could accelerate regional development. Brazil's extensive biofuels expertise could be shared with other tropical nations. Uruguay's experience with renewable energy could serve as a guide for similarly sized economies. Alternative climate finance mechanisms through regional development banks should supplement dependence on Northern institutions.

Discussion and Conclusions

This analysis synthesises policy research and extensive regional consultation into six pillars for a progressive green industrial policy agenda: (1) Pragmatic regional collaboration around targeted productive chains, establishing coordination mechanisms for renewable energy, battery manufacturing, and green hydrogen; (2) Strengthened state capacity through institutional development and democratic governance frameworks; (3) Shifting natural resource sectors from rent extraction toward innovation ecosystems with local value capture; (4) Strategic neoindustrialisation connecting sectors with frontier technologies through South-South partnerships; (5) Intentional green industrialisation in renewable energy equipment manufacturing and clean technology production; and (6) Building broad social legitimacy through just transition policies linking transformation with employment, skills development, and welfare enhancement.

For genuinely green industrial policy to succeed in Latin America, it must address four key dimensions simultaneously. First, respecting planetary boundaries while enabling development requires moving beyond false dichotomies between environment and growth. Second, achieving transformation at unprecedented speed and scale demands mobilising state capacity, public investment, and sectoral coordination. Third, mobilising financing to bridge the substantial climate finance gap requires repurposing existing mechanisms and establishing new South-South financial institutions. Fourth, facilitating international cooperation through South-South solidarity can counter Global North-led failures in multilateral institutions.

The lithium triangle exemplifies current contradictions. Despite holding massive reserves, Argentina, Bolivia, and Chile have struggled to move beyond raw-material exports toward battery manufacturing. Water-intensive extraction creates sacrifice zones impacting indigenous communities, while revenues flow primarily to transnational corporations rather than financing local development. This pattern must be reversed through strategic value capture, local processing, and technology development controlled by regional actors.

The stakes could not be higher. Without structural change, Latin America risks either ongoing stagnation or a return to dependent primary-export models under a green rhetoric. Through coordinated efforts grounded in democratic governance and social legitimacy, the region can unlock its potential for sovereign and sustainable development. The challenge is whether political will, institutional capacity, and social mobilisation can come together to unlock this potential before climate tipping points shut down transformative opportunities.

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Recommendations

- Establish regional coordination mechanisms for productive chains, particularly in renewable energy, battery manufacturing, and green hydrogen, ensuring value capture by regional actors rather than external corporations.
- Strengthen state capacity through institutional development, strategic planning, infrastructure, and democratic governance frameworks that centre social input in productive transformation.
- Reform extractive sectors toward higher-value-added production, including local processing and downstream manufacturing, with precise mechanisms for revenue distribution and indigenous community benefit.
- Pursue South-South cooperation frameworks that counteract Global North dominance, building technology sharing agreements and joint industrial ventures across Latin America, Africa, and Asia.
- Develop comprehensive just transition policies that explicitly link productive transformation with employment creation, skills development, and welfare enhancement for working populations.
- Mobilise public finance through reformed development banks, debt relief for climate investment, and new concessional financing instruments tailored to green industrialisation requirements.

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1.6 Case study 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions

Overview

This case study examines green industrial policy in Southeast Asia, exploring how developmental states with established industrial upgrading capabilities navigate green transitions while maintaining competitive positions in global value chains. Drawing on empirical research from an international workshop held in May 2025 in Bangkok, jointly organised by the Horizon Europe GreenPaths project, the ERC GRIP-ARM project, TNI, and the Science Technology and Innovation Policy Institute (STIPI). The study investigates the experiences of six Southeast Asian countries: Vietnam, Thailand, Malaysia, Indonesia, Singapore, and the Philippines—through a critical political economy perspective.

Our analysis reveals that although countries like Vietnam and Thailand have rapidly deployed effective national green policies through state coordination, export-oriented industrialisation patterns often reproduce precarious labour conditions and environmental pollution despite 'green' branding. The paper contributes to debates on industrial policy, state capacity, and the political economy of just transitions in the Global South. It argues that Southeast Asian developmental states possess strong institutional capacities for coordinated green transitions exceeding market-led approaches; however, democratising these processes remains essential for genuinely fair and sustainable outcomes.

Additionally, we examine the complex relationship between European Union climate and trade policies and Asia-Pacific green industrial strategies, revealing both convergences and contradictions.

Research Questions

This research investigates three core questions: First, how do Southeast Asian developmental state models approach green industrial transitions, and what institutional capacities enable rapid deployment of renewable energy and green manufacturing? Second, what are the environmental and social costs of green industrialisation, particularly regarding labour conditions, gender dynamics, and resource extraction? Third, how do European Union policies—through climate standards, trade regimes, and strategic competition—shape Southeast Asian green industrial development pathways, and what opportunities exist for alternative South-South cooperation frameworks?

Methods

This case study is based on a literature review combined with regional stakeholder consultations and expert interviews spanning East, South, and Southeast Asia. Beyond conventional desktop research, this analysis draws comprehensively on an international seminar convened on 21–23 May 2025 at the Science, Technology and Innovation Policy Institute (STIPI) at King Mongkut's University of Technology Thonburi in Bangkok. The workshop, co-organised by STIPI, the Transnational Institute, the GreenPaths project, the ERC-funded GRIP-ARM project, and the University of Sussex, brought together academic researchers, civil society activists, government

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policymakers, and development practitioners from across the Asia Pacific. Participants included specialists with expertise spanning China, India, Indonesia, the Philippines, Singapore, South Korea, Thailand, and Vietnam. This diverse expert community provided crucial insights into implementation challenges, political obstacles to green transition, labour market dynamics, supply chain vulnerabilities, and divergent national policy priorities.

The workshop format enabled comparative discussion of how different developmental state models approach sectoral promotion, technology transfer, and labour governance within contexts of green industrialisation. Participants examined divergent national pathways: Vietnam's aggressive feed-in tariffs, contrasting with Thailand's hybrid state-private approach; Indonesia's infrastructure-led development, versus the Philippines' fragmented institutional coordination; and Singapore's comprehensive urban planning, versus Malaysia's selective sectoral targeting. These comparative discussions revealed both possibilities for policy learning and structural constraints limiting policy transfer across national contexts. The diversity of institutional arrangements and policy outcomes across Southeast Asia demonstrates that green industrial policy is not a singular approach but a family of strategies adapted to national circumstances, regional positioning, and governance capacities.

The analysis employs a multidimensional framework that recognises that Southeast Asia's distinctive starting point differs fundamentally from those of other Global South regions. Environmental dimensions encompass both costs (pollution, deforestation, climate impacts from manufacturing) and benefits (renewable energy deployment, improved urban environmental quality). Social dimensions encompass labour precarity, displacement, and inequality alongside poverty reduction and enhanced state capacity for sectoral coordination. This balanced analytical approach avoids both uncritical celebration of green industrialisation and dismissal of genuine material achievements. The framework recognises that green transitions in Southeast Asia occur within inherited structures of inequality, while simultaneously creating opportunities for transformative change through deliberate policy choices.

The resurgence of industrial policy in the twenty-first century represents a decisive departure from decades of neoliberal orthodoxy. This transformation reflects multiple intersecting pressures: intensifying strategic competition between China and Western powers, the imperative of rapid decarbonisation amid the climate crisis, and the recognition that market mechanisms alone are insufficient to drive technological transition. Within this context, green industrial policy has emerged as a central framework through which developing economies attempt to reconcile economic development objectives with environmental sustainability imperatives (Juhász et al., 2024; Nem Singh, 2023).

Southeast Asia occupies a distinctive and consequential position within global green industrial dynamics. The region accounts for approximately 12% of global manufacturing and hosts pivotal links in emerging supply chains for renewable energy technologies, electric vehicles, batteries, and semiconductor components. Nevertheless, Southeast Asian governments face contradictory pressures: the imperative to upgrade manufacturing capabilities while addressing labour precarity, the need to decarbonise while managing fossil fuel dependencies, and the requirement to capture value chains while integrating within asymmetrical global trade architectures. Moreover, these dynamics unfold within a complex geopolitical context in which the United States, the European Union, and China each pursue distinct industrial policy regimes with significant implications for Asian development pathways (Nem Singh et al., 2025).

This paper presents a comprehensive political economy analysis of green industrial policy in Southeast Asia. Drawing on qualitative research combining systematic literature review, regional stakeholder consultations, and an international research workshop convened in Bangkok in May 2025, the analysis examines six focal countries: Vietnam, Thailand, Malaysia, Indonesia, Singapore, and the Philippines. The paper adopts a progressive political economy perspective

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informed by developmental state theory, critical global value chain analysis, and just transition frameworks. This approach enables examination of both material achievements and persistent contradictions in Southeast Asian green industrialisation. The analysis seeks to understand whether Southeast Asian developmental state models can achieve ecological sustainability and social justice without compromising economic dynamism and poverty alleviation, and whether global competitive pressures and asymmetrical power structures within international trade regimes obstruct transformative green transitions.

Findings and Results

Developmental State Capacities

Southeast Asian economies occupy a distinctive position within the political economy of global industrial development. Following Japan's postwar developmental state model and the subsequent successful industrialisation of South Korea and Taiwan, Southeast Asian countries adopted systematic 'late development' strategies emphasising manufacturing capacity building, technology absorption, and productivity improvement. These strategies explicitly deployed state institutions to direct capital, manage technology flows, and coordinate sectoral development (Amsden, 1992; Wade, 1990). Unlike neoliberal frameworks that emphasise market liberalisation, developmental state approaches recognise that deliberate state intervention remains necessary for late-industrialising economies to overcome structural disadvantages and compete within global value chains.

Thailand exemplifies this approach. Through coordinated state orchestration of foreign direct investment, local content requirements, targeted skills development, and deliberate export promotion, the country became Southeast Asia's automotive manufacturing hub, producing over 2 million vehicles annually (Doner et al., 2021). This transformation was not spontaneous but reflected deliberate policy choices by state institutions, including the Board of Investment, which screened foreign investment proposals, imposed performance requirements, and channelled resources towards priority sectors. Malaysia pursued similar strategies within the electronics sector, advancing from simple assembly operations towards design and testing services. The Malaysian state actively promoted indigenous firm development through targeted policies and strategic support for national champions. Vietnam's more recent integration into global value chains demonstrates the continued relevance of developmental state approaches, particularly through state support for domestic champions such as VinFast in electric vehicle manufacturing and the deliberate cultivation of solar panel production capabilities (Nem Singh et al., 2025).

Substantial material improvements for populations accompanied these successes. Vietnam reduced poverty from 58% in 1993 to under 5% by 2020, among the fastest poverty-reduction trajectories globally, while maintaining world-leading growth rates (World Bank, 2021). Thailand's coordinated development eliminated absolute poverty through sustained manufacturing employment and rural development programmes. Malaysia achieved upper-middle-income status through deliberate sectoral upgrading. Public education and training systems built workforce capabilities, enabling continuous industrial upgrading. State enterprises and sovereign wealth funds maintained strategic control over critical sectors despite liberalisation pressures, preserving national autonomy in determining development trajectories. Coordinated wage growth policies in manufacturing sectors significantly improved living standards. However, these advances remain persistently unequal across regions and sectors, between urban and rural areas, and between core and peripheral workers.

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Significantly, Southeast Asian manufacturing wages are substantially higher than those in South Asia or sub-Saharan Africa, despite persistent labour exploitation (Natsuda and Thoburn, 2021). These institutional legacies—distinctive amongst Global South regions—fundamentally shape possibilities for green industrial transitions. While labour conditions in export sectors warrant sustained criticism, Southeast Asian developmental states have demonstrated capacities for coordinated sectoral development that most other developing economies lack. Understanding contemporary green industrial policy requires recognising both the institutional capabilities these achievements represent and the persistent injustices they contain. The question confronting contemporary policymakers is whether these developmental state capacities can be redirected towards genuinely sustainable and equitable green transitions, or whether the contradictions embedded in previous industrialisation patterns will reproduce themselves in green sectors.

The Philippines presents a contrasting case, revealing how developmental-state institutional weakness constrains the possibilities for green industrial policy. Unlike Thailand and Vietnam, which have coherent, long-term sectoral strategies, Philippine policymaking has remained fragmented across competing bureaucratic agencies, resulting in inconsistent policy direction. The shift away from industrial policy following the 1986 democratisation, undertaken as part of neoliberal structural adjustment conditionalities, dismantled state institutions that had previously supported manufacturing development. Decades of liberalisation left the Philippines with a limited export base diversity, a weak supply chain integration, and inadequate infrastructure for industrial expansion. When climate change and international green demand emerged as development opportunities, the Philippines lacked the institutional capacity for a coordinated response comparable to those of Vietnamese or Thai approaches. This trajectory reveals that developmental state capabilities, once dismantled, prove extremely difficult to rebuild. Democratic transitions, undertaken under constraints imposed by international financial institutions, often involved an explicit rejection of state-directed development approaches, creating path dependencies that limit subsequent policy options.

Environmental Achievements and Contradictions

Vietnam has achieved one of the world's fastest solar energy transitions, demonstrating the potential of state-coordinated green industrial deployment. Installed solar capacity expanded from 86 megawatts in 2018 to approximately 16.5–17.6 gigawatts by the end of 2020, driven by aggressive state-mandated feed-in tariffs of US$93.5 per megawatt-hour (Do and Sharma, 2020; ASEAN Centre for Energy, 2021). This rapid expansion made Vietnam the world's third-largest solar market in 2020, with approximately 101,000 rooftop solar installations predominantly owned by small-scale producers and farmers seeking supplementary income. By the end of 2020, Vietnam's installed wind power capacity reached 600 megawatts. These achievements reflect deliberate state coordination through the Ministry of Planning and Investment, which maintains comprehensive sectoral strategies integrating industrial development, infrastructure provision, and workforce training. The Feed-in Tariff mechanism, while subsequently modified due to cost concerns, catalysed unprecedented renewable energy expansion by creating reliable investment certainty for both utility-scale and distributed renewable projects.

The Vietnamese solar success reflects not merely technological adoption but deliberate institutional innovation. The Feed-in Tariff mechanism, substantially higher than globally conventional rates, created investment certainty, attracting both domestic and foreign capital. Small farmers in the Mekong Delta installed rooftop systems, capturing tariff revenues to supplement agricultural income. The distributed renewable deployment differed markedly from conventional utility-scale approaches, creating more decentralised production and broader

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stakeholder participation. However, subsequent tariff reductions and grid integration challenges reveal tensions within rapid expansion: grid stability concerns, storage limitations, and the vulnerability of small producers to tariff policy changes. These technical challenges require ongoing state coordination and long-term policy commitment rather than market-driven spontaneous resolution.

Thailand's Alternative Energy Development Plan (2015–2036) coordinates the systematic expansion of solar, wind, and biomass energy, aiming to achieve 30% of final energy consumption from renewable sources by 2036 (Asian Development Bank, n.d.). Critically, the state utility EGAT retains strategic control over this transition while collaborating with private developers in accordance with government-determined parameters. This hybrid approach preserves public-interest representation while leveraging private-sector efficiency and capital. Thailand has successfully reduced its reliance on coal—which dominated its energy mix throughout the 1990s and 2000s—while simultaneously maintaining industrial competitiveness within competitive global automotive and electronics value chains, representing a substantially more sophisticated achievement than neoliberal narratives typically acknowledge. State planning enabled coordinated infrastructure development, technology acquisition, and workforce training supporting renewable energy transition while maintaining grid stability and industrial energy security.

Singapore's Green Plan 2030 aims to reach net-zero emissions by 2050, with 60% of electricity produced from low-carbon sources by 2035, including solar energy, regional power imports, and emerging technologies. An extensive public transport network covers 99% of households within a 10-minute walk of transit stations, resulting in notably low private vehicle ownership and associated emissions. These achievements, uncommon amongst comparable-income countries, reflect deliberate state orchestration of urban development, energy infrastructure, and transport systems. Singapore's constrained geography and small population enabled comprehensive state direction of development patterns, demonstrating the possibilities for integrated, climate-aligned urban planning when genuine policy autonomy exists.

Despite these renewable energy achievements, Southeast Asia faces severe environmental costs from green industrialisation. The region added over 50 gigawatts of coal capacity during the 2010s, substantially offsetting renewable energy deployment. Indonesia and the Philippines' coal mining expanded precisely as solar and wind capacity increased, revealing the contradictions in the simultaneous expansion of green and fossil fuels. Pollution from export-oriented manufacturing persists despite 'green' sector labelling, particularly in electronics and battery production. Environmental degradation from resource extraction—lithium, cobalt, nickel, and copper—required for clean energy transitions generates significant ecological destruction. It displaces communities, especially in Indonesian and Philippine territories where mining concessions overlap with indigenous lands and critical ecosystems (Nem Singh et al., 2025).

The contradictions between green energy expansion and resource extraction deserve particular attention. Southeast Asia's critical mineral wealth—including lithium deposits in Indonesia and Myanmar, cobalt in the Philippines, and nickel in Indonesia—positions the region as essential to global clean energy transitions. However, mining for these materials generates severe environmental costs: lithium extraction requires enormous water use in water-stressed regions, cobalt mining generates toxic tailings that contaminate water supplies, and nickel mining drives forest destruction. Mining communities face displacement, water contamination, and minimal compensation relative to the value of the extracted minerals. International mining companies, often backed by governments of the Global North and development finance institutions, structure extraction to maximise capital returns rather than local development benefits. Revenue capture by national governments often benefits connected elites rather than affected communities. Within Green industrial policy frameworks, critical mineral extraction remains largely unaddressed, with

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renewable energy expansion proceeding as if mineral supplies are infinite and costless. There is a fundamental contradiction: green industrial policy cannot proceed on current trajectories without confronting the extractive violence required for mineral sourcing. Genuine just transitions must include mining communities and establish equitable benefit-sharing arrangements with transparent revenue allocation and genuine community consent rights.

Vietnam's rapid expansion of solar panel manufacturing, despite its green credentials, relies on energy-intensive production processes that are substantially powered by fossil fuels. The carbon payback period for solar panel manufacturing remains substantial, requiring careful lifecycle accounting. Malaysia's electronics industry, which supplies critical components for renewable energy systems, generates substantial electronic waste and chemical pollution, often exported to less developed countries for informal recycling. Thailand's electric vehicle manufacturing ambitions require expansion of lithium extraction and refining infrastructure, with associated environmental costs transferred to mining regions and neighbouring countries. These contradictions demonstrate that export-oriented green manufacturing reproduces environmental degradation despite sustainability branding. The 'greening' of industrial policy has not fundamentally altered the extractive logic structuring Southeast Asian integration within global value chains. Sustainability remains predominantly oriented towards the Global North's consumer preferences and regulatory requirements rather than genuine ecological transformation.

Labour, Inequality, and Exploitation

Green industrial policy in Southeast Asia has generated substantial manufacturing employment in solar panels, electronics, and electric vehicles. Vietnam's solar sector expansion created direct and indirect employment opportunities while contributing to poverty reduction through export-driven growth. Manufacturing employment remains a crucial pathway for workers to access formal-sector positions, social protections, and wage income that exceeds that of agricultural alternatives. State-coordinated industrial development has distributed employment benefits unevenly but significantly compared with purely market-driven allocation. Thai automotive manufacturing supported millions of workers across assembly plants, component suppliers, logistics, and ancillary services. Malaysian electronics workers, despite exploitation, achieved living standards substantially higher than those available in agriculture or informal services.

However, these labour gains coexist with persistent precarity and exploitation. Green manufacturing sectors—particularly electronics and solar panel production—display working conditions structurally identical to those condemned in traditional manufacturing sectors (Natsuda and Thoburn, 2021). Workers face excessive hours (regularly exceeding fifty per week), inadequate wages relative to productivity, limited collective bargaining rights, and exposure to hazardous chemicals and processes. Women concentrate disproportionately in the worst-remunerated positions with limited advancement pathways, performing fine assembly work that damages eyesight and requires intense concentration for minimal compensation. Migrant workers, particularly from Myanmar, Cambodia, and Laos, face systematic exploitation with minimal legal protection. These dynamics reveal that 'green' sector designation does not assure labour justice or worker wellbeing. The structural vulnerability of workers remains determined by their position in the global value chain rather than by sectoral environmental credentials.

Gender dynamics within green manufacturing reveal particularly acute injustices. Women constitute seventy to 80%of workers in electronics assembly and solar panel manufacturing, concentrated in positions requiring fine motor control but offering minimal skill development. Wage segregation persists despite women's similar productivity to men, with women typically earning 15-30% less for identical work. Pregnancy discrimination remains widespread, with

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workers pressured to resign when pregnant, losing benefits and employment security. Sexual harassment by supervisors and male workers occurs with minimal institutional accountability. Childcare responsibilities disproportionately burden women, limiting their ability to work overtime shifts or secure promotions requiring flexibility. These gendered labour dynamics reproduce patriarchal structures within ostensibly modern manufacturing sectors, demonstrating that sectoral modernity carries no inherent gender justice implications without deliberate policy interventions.

Developmental state models have enabled poverty reduction and improvements in living standards compared with alternatives, yet have systematically suppressed independent labour organising. Thailand's post-1997 democratisation movement strengthened labour advocacy despite subsequent military interventions, creating space for independent unions and collective bargaining in some sectors. Vietnam's authoritarian system achieved rapid growth but systematically restricted civil society participation, including independent labour organisations and environmental advocacy, which are essential for equitable transitions. Labour federations remain state-controlled, limiting capacity for genuine worker representation in industrial policy formulation. Without democratisation enabling independent labour organisation, genuine collective bargaining, and democratic participation in industrial policy formulation, green transitions risk perpetuating patterns of exploitation beneath environmental legitimacy. This tension between the developmental state's capacity for rapid transition and its tendency towards authoritarian governance remains unresolved, constraining possibilities for transformative social change.

The relationship between labour organising and green industrial policy deserves closer examination. In Thailand, independent unions have achieved significant gains despite state restrictions, securing wage improvements and safety protections in several manufacturing sectors. In Vietnam, the absence of independent unions means state-controlled federations cannot effectively represent worker interests against employer demands. In Malaysia, restrictions on migrant worker organising mean the workforce, which is most vulnerable to exploitation, lacks collective representation. However, worker organising across supply chains faces particular challenges within green manufacturing: production often disperses across multiple suppliers in different countries, complicating union coordination; rapid technological change creates skills gaps limiting worker bargaining power; employer threats to relocate to lower-cost jurisdictions discipline worker demands; international competition pressures manufacturers to minimise labour costs. Building adequate worker power within green supply chains requires simultaneously strengthening national labour movements and developing international labour solidarity mechanisms enabling coordination across borders. This demands resources and strategic support rarely available to labour organisations operating with minimal external support, particularly in contexts where governments restrict independent organising.

European Union Policies and Global Supply Chains

The European Union has emerged as a significant actor shaping Southeast Asian green industrial policy development through multiple policy mechanisms spanning climate governance, trade regimes, supply chain regulation, and sectoral standards. EU policies both enable and constrain Southeast Asian green industrialisation pathways in complex ways, reflecting underlying tensions between the EU's own strategic autonomy imperatives and stated commitments to equitable development and climate justice. Understanding these dynamics requires examining how the Global North's standard-setting authority intersects with the Global South's policy constraints, particularly in asymmetrical trade relationships and global value chains. European sustainability demands increasingly structure production requirements for suppliers, creating cascading compliance burdens throughout supply chains.

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EU environmental regulations and product standards—particularly directives governing battery composition, carbon content, and supply chain transparency—substantially shape Southeast Asian manufacturing specifications. The Battery Regulation (EU 2023/1542) and proposed Carbon Border Adjustment Mechanism (CBAM) establish environmental and labour standards that Southeast Asian producers must meet to access European markets. These regulations reflect legitimate environmental governance concerns, yet create compliance burdens disproportionately affecting smaller producers and less-capitalised manufacturers. Companies operating within global value chains increasingly demand proof of 'ethical' sourcing and decarbonised production, intensifying pressure on Southeast Asian suppliers to rapidly upgrade environmental and social standards. The cost of compliance documentation, third-party auditing, and certification creates barriers to market entry for smaller manufacturers.

The EU's supply chain due diligence directives, which demand detailed documentation of labour conditions, environmental impacts, and material sourcing across production networks, create informational asymmetries that favour large multinational corporations capable of managing compliance documentation. Smaller Southeast Asian manufacturers face significant costs in establishing compliance infrastructure, often requiring external consultants and certification bodies based in the Global North. These regulations, while addressing legitimate concerns about labour exploitation and environmental degradation, simultaneously entrench power asymmetries within global value chains. Southeast Asian companies must comply with EU standards without formal participation in standard-setting processes, reflecting broader North-South structural inequalities in global governance (Farrell and Newman, 2019). The standardisation process itself marginalises Global South voices, reproducing historical patterns in which more prosperous and more powerful economies set the parameters for Global South production.

EU standards function not merely as technical requirements but as mechanisms through which Global North economies shape production relations in Global South suppliers. The standards assume particular production models, worker relations, and documentation practices reflecting established manufacturing experience. They impose costs on alternative models—whether more decentralised small producer networks or cooperative manufacturing arrangements—that might be locally appropriate but do not conform to European expectations. Compliance requires hiring external auditors, predominantly based in the North, creating service export opportunities for Global North firms while imposing costs on Global South manufacturers. The standards embody normative assumptions about appropriate governance, labour relations, and environmental management derived from Global North contexts but presented as universal best practices. Southeast Asian producers, lacking seats at standard-setting tables, absorb compliance costs without participating in defining requirements. This trend reproduces colonial patterns in which peripheral economies adopt institutional models designed elsewhere, without genuine choice or the capacity to negotiate alternatives. Challenging Global North dominance in standard-setting requires both raising the Global South's voice in international forums and developing alternative standards that reflect Global South priorities and development needs.

The EU's industrial policy response to Chinese technological advancement has intensified competition between Western and Asian developmental state models. EU initiatives, including the European Chips Act (€43 billion), the Net-Zero Industry Act, and the proposed Critical Raw Materials Act, attempt to secure European technological sovereignty in the semiconductor and clean energy sectors. These EU policies privilege European producers and attract semiconductor and battery manufacturing investment to Europe, directly competing with Southeast Asian industrialisation objectives. Simultaneously, the EU pursues selective trade negotiations and preferential agreements with Southeast Asian countries, increasingly incorporating environmental and labour standards chapters that create leverage points through which the EU shapes partner-

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country policies. Trade agreements become mechanisms through which Global North environmental and labour preferences become binding commitments for Global South countries.

The EU's Carbon Border Adjustment Mechanism, though designed to prevent carbon leakage and level the playing field internationally, will disproportionately affect Southeast Asian manufacturers reliant on fossil fuels. While countries with access to renewable energy (Vietnam, Thailand) may weather CBAM impacts more successfully, manufacturers in coal-dependent economies face substantial tariff costs unless energy systems decarbonise rapidly. The CBAM simultaneously creates incentive structures for green energy investment—potentially supporting EU policy objectives—and imposes costs that favour capital-abundant Global North producers over less-capitalised Global South manufacturers. This policy contradicts just transition principles and climate justice frameworks prioritising differentiated responsibilities reflecting historical emissions and development needs (Oqubay et al., 2020). The burden of transition falls disproportionately on economies least responsible for historical emissions.

The CBAM implementation timeline reveals particular sensitivity to transition concerns. The mechanism begins with a reporting phase (2023–2025) requiring importers to monitor and declare the carbon content of imported goods, followed by a transition phase (2025–2034) in which importers purchase CBAM certificates at gradually increasing rates, eventually replacing tariff exemptions and rebates under the EU's existing carbon trading system. For Southeast Asian exporters, this creates cascading compliance burdens and cost uncertainties. Manufacturers must conduct lifecycle carbon assessments across supply chains, often extending to resource extraction in third countries beyond their direct control. The complexity of carbon accounting creates opportunities for gaming and uncertainty about actual carbon content, disadvantaging smaller producers without sophisticated monitoring capacity. Large multinational corporations can absorb CBAM costs more readily, potentially accelerating consolidation within Southeast Asian manufacturing as smaller competitors become uncompetitive.

EU policies prioritising domestic semiconductor and battery manufacturing may inadvertently marginalise Southeast Asian producers from critical green technology supply chains. The European Chips Act and Net-Zero Industry Act create substantial subsidies attracting battery and semiconductor investment to Europe, potentially reducing demand for Southeast Asian intermediate component production. This risks reproducing patterns familiar from earlier industrial transitions: peripheral economies develop manufacturing capacity for sectors subsequently relocated to core countries as technological sophistication increases. For Southeast Asia, which has invested substantially in semiconductor assembly, battery component manufacturing, and electric vehicle production, EU reshoring strategies threaten the profitability and viability of industrialisation investments. The region's development aspirations depend on sustained manufacturing capacity, not relegation to remaining labour-intensive assembly operations.

However, the complete reshoring scenario remains unlikely. EU industrial policy realistically aims to increase European production shares while maintaining offshore production in favourable locations, particularly for labour-intensive assembly operations. This reality creates opportunities for Southeast Asian manufacturers capable of producing components and assembled products meeting EU environmental and labour standards. The challenge for Southeast Asian policymakers is to position countries within the reshaped international division of labour, where policy options are constrained by EU standard-setting authority and investment prerogatives. Conversely, Southeast Asian governments are actively pursuing diversified supply chain relationships, particularly developing South-South cooperation with India, China, and Latin America, potentially reducing dependence on European markets and standards (Nem Singh et al., 2025). Regional cooperation mechanisms, including ASEAN, provide frameworks for collective

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negotiation with Global North economies, though institutional weaknesses limit their effectiveness.

South-South cooperation, particularly with China and India, offers alternative pathways to reducing dependence on Global North's markets and standards. China's Belt and Road Initiative has invested substantially in Southeast Asian energy infrastructure, manufacturing facilities, and critical mineral extraction. While controversial due to its environmental and labour implications, Chinese involvement offers alternatives to Western-dominated development finance and technology partnerships. India's solar manufacturing expansion and growing battery production capacity create opportunities for technology cooperation. However, South-South cooperation carries distinct risks: Chinese and Indian investments sometimes reproduce exploitative labour practices and environmental degradation in the absence of adequate host-country regulation; technology transfer agreements may embed dependence on foreign firms rather than building genuine domestic capacity; financial arrangements can create debt burdens that limit policy autonomy. Genuine progressive South-South cooperation requires strong host-country regulation, transparent governance, and deliberate capacity-building rather than mere technology substitution. ASEAN institutions could facilitate South-South cooperation frameworks that enable knowledge sharing and joint development initiatives. However, this requires ASEAN members to overcome historical suspicions and competing interests to establish effective regional mechanisms. Given diverse development levels and policy orientations across ASEAN, this remains politically challenging. Nevertheless, developing genuine South-South alternatives to Global North-dominated frameworks represents an essential element of progressive green industrial strategy.

Main Results

State coordination remains absolutely crucial for the swift deployment of renewable energy infrastructure and integrated green industrial sectors. Vietnam's extraordinary solar expansion and Thailand's coordinated renewable planning demonstrate conclusively that effective government intervention outperforms market-led approaches in rapidly scaling clean energy. This finding directly contradicts three decades of neoliberal policy recommendations emphasising private initiative and market mechanisms. Southeast Asian experience demonstrates that without deliberate state orchestration, capital flows remain insufficient, coordination failures persist, and technological transition proceeds much more slowly. State-owned utilities retaining strategic control, combined with performance requirements imposed on foreign investors, enable rapid sectoral transformation that market mechanisms alone cannot achieve (Nem Singh, 2023; Juhász et al., 2024). The speed of renewable energy deployment in Vietnam and Thailand significantly exceeds comparable-income countries relying on market mechanisms.

Vietnam's feed-in tariff mechanism enabled grid-connected capacity expansion within 2 to 3 years, whereas comparable countries required significantly longer periods. Thailand's integrated renewable planning, spanning energy, water, and agricultural sectors, enabled coordinated infrastructure development. These achievements reflect deliberate state institutions directing capital, setting priorities, and implementing consistent policies. A comparative analysis of renewable energy expansion across developing countries reveals a consistent pattern: countries with strong state capacity and deliberate industrial policy achieved faster transitions than those relying on market-driven alternatives. This finding carries profound implications for global climate policy: achieving the requisite carbon reductions within the remaining timeframe likely requires strengthening state capacities for coordinated industrial policy, contradicting dominant neoliberal frameworks that emphasise privatisation and market liberalisation. Climate justice

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requires not merely transitions but equitable transitions that protect and advance working people's interests.

'Green' sector designation offers absolutely no assurance of social justice, labour dignity, or environmental integrity. Electronics manufacturing and solar panel production display exploitative working conditions structurally identical to those in traditional sectors, which have been condemned for decades. Without robust independent labour organisations, democratic participation in policy formulation, and mechanisms ensuring fair distribution of gains, green industrialisation risks perpetuating exploitation beneath environmental legitimacy. This finding challenges mainstream narratives equating green transitions with social progress. The relationship between sectoral 'greenness' and labour standards is contingent, dependent on deliberate policies that prioritise worker rights and democratic governance rather than being automatic. Environmental credentials carry no inherent labour or social benefits; these outcomes require deliberate political struggle.

Electronics manufacturing sectors designated as 'green' due to producing renewable energy components display identical labour exploitation patterns to traditional sectors. Worker wages typically range from three to five US dollars per day, insufficient to meet basic needs in most Southeast Asian contexts. Working hours regularly exceed fifty per week with minimal compensation for overtime. Occupational health hazards, including chemical exposure and repetitive strain injuries, remain inadequately addressed. Women workers are concentrated in the lowest-wage positions with limited advancement pathways. Migrant workers face particular vulnerability with minimal legal protections and employer restrictions on freedom of movement. These conditions persist despite international scrutiny of supply chains and certification systems that claim to verify ethical labour practices. The gap between certified compliance and actual labour conditions reveals fundamental limitations of market-based accountability mechanisms. Genuine labour justice requires independent worker organisations capable of monitoring conditions and negotiating improvements directly with employers, supported by government enforcement of labour standards. This demands strengthening rather than weakening labour regulations, contrary to competitive liberalisation pressures.

Developmental state models necessitate democratisation for genuinely transformative results. Authoritarian steering facilitated rapid industrialisation in past contexts, but did so systematically at substantial costs to labour rights, environmental health, and democratic participation. Contemporary green transitions demand participatory governance extending far beyond elite consultations. Thailand's recent democratic movements strengthened labour advocacy despite militarism; Vietnam's restrictions on civil society participation limit equitable transitions. Policymakers in other Global South regions contemplating developmental state strategies must grapple with this fundamental tension: developmental state effectiveness in previous eras occurred within authoritarian contexts that systematically repressed labour organisation and environmental advocacy (Natsuda and Thoburn, 2021). This tension suggests that achieving genuinely just green transitions may require developmental state institutional capacities combined with democratic accountability mechanisms absent from historical models.

Assertive state policies actively enable opportunities for technology transfer and industrial upgrading. Local content requirements, performance conditions imposed on foreign investment, support for domestic research institutes, and incentives for domestic firm development have fostered indigenous technological capabilities despite neoliberal predictions that such policies would fail (Doner et al., 2021). Multinational corporations, responding to state pressure and market opportunities, have increasingly localised technological development. Vietnam's emergence as a solar panel producer reflects deliberate state investment in manufacturing capability, including support for domestic firms and technology partnerships. Thailand's automotive sophistication reflects decades of coordinated state-business collaboration, including

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consistent support for supplier development and quality improvement programmes. These achievements remain unthinkable under purely market-led approaches that privilege foreign investors' prerogatives without reciprocal development obligations (Wade, 1990; Amsden, 1992). Asymmetrical market access for foreign firms must be balanced by development conditions protecting the local industry.

Technology transfer mechanisms within green industrial policy reveal inherent tensions between profit imperatives and development objectives. Multinational corporations typically resist genuine technology transfer, preferring to supply components and maintain monopolies on advanced production stages. Vietnamese solar companies, despite rapid capacity expansion, predominantly assemble imported cells rather than manufacturing from raw materials, limiting value capture. Thai automotive firms, while achieving substantial domestic content through local suppliers, remain dependent on foreign firms for engine technology and advanced components. This situation reflects global value chain structures in which the lowest-wage locations focus on labour-intensive assembly operations, while core-country corporations control capital-intensive, technology-rich stages. Breaking these patterns requires deliberate policy intervention: mandatory technology transfer as investment conditions, support for domestic research and development, protection of infant industries during capability-building, and patient capital to enable long-term development investments. China's experience demonstrates the possibilities for indigenous technological development when the state consistently prioritises capability-building over short-term profit extraction. However, this requires regulatory autonomy and development finance capabilities that many Southeast Asian countries lack. International technology cooperation frameworks, through ASEAN or South-South partnerships, could strengthen technological capabilities while reducing individual countries' political costs of protecting domestic industries.

Discussion and Conclusions

The political economy of green industrial transition in Southeast Asia involves fundamental questions of power, legitimacy, and democratic governance. Technical policies alone—whether regarding renewable energy deployment, manufacturing incentives, or labour standards—prove insufficient without political movements capable of sustaining pressure for equitable implementation. History demonstrates that progressive reforms typically result from organised social pressure rather than enlightened policymakers spontaneously embracing justice. Labour movements, environmental organisations, farmer organisations, and youth climate activists represent essential constituencies whose mobilisation determines whether green transitions serve the interests of the majority or reproduce existing inequalities. Supporting these movements through funding, international solidarity, and political recognition represents a crucial contribution to progressive outcomes. Simultaneously, sympathetic policymakers and bureaucrats require protection and support when implementing progressive policies against opposition from entrenched interests. Building cross-sectoral alliances connecting labour, environmental, peasant, and development-focused organisations creates opportunities for political pressure that transcends sectional interests. These movements must simultaneously operate nationally, where state power concentrates, and transnationally, where corporate and financial power operates. This reality requires innovations in movement coordination, strategic thinking, and resource mobilisation, often beyond the current capacities of civil society organisations operating with limited resources.

Southeast Asia's developmental state legacies offer essential institutional foundations for green transitions that most other Global South regions fundamentally lack. Strong state coordination, sectoral expertise, engagement with foreign investors, and invested capacity for long-term planning represent comparative advantages enabling rapid technological deployment. These institutional capabilities have enabled renewable energy transitions and the expansion of green

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manufacturing, substantially outpacing market-driven alternatives in comparable-income countries. The region offers opportunities for accelerated environmental transition when state capacity is deliberately mobilised towards sustainability objectives.

Simultaneously, achieving genuinely just and sustainable outcomes requires democratising developmental state capacities, enhancing labour and environmental protections, and challenging both domestic and international power structures that obstruct transformative change. The analysis reveals persistent contradictions: state coordination enables rapid transition but without democratic governance risks authoritarian imposition; manufacturing growth creates employment but often involves exploitative working conditions; renewable energy expands while fossil fuels simultaneously increase; green sectors emerge while extractive logic persists. These contradictions cannot be resolved through technical policy adjustments alone but demand a fundamental reorientation of power relations and development priorities. The stakes involve distributional justice and genuine ecological transformation, not merely technological substitution that maintains existing power hierarchies.

European Union policies shape these dynamics substantially through climate standards, trade regimes, and strategic competition, yet often in ways that reproduce North-South inequalities and constrain Southeast Asian policy autonomy. Progressive green industrial policy requires both advancing environmental and labour standards while resisting Global North domination of standard-setting and supply chain governance. Southeast Asian governments must simultaneously embrace state capacity for sectoral development while democratising these capacities; maintain openness to foreign investment while protecting technology and establishing development conditions; and integrate into global value chains while building regional cooperation, reducing Global North dependence. These tensions cannot be perfectly reconciled but require sustained political negotiation.

The stakes for Southeast Asia are profound: the region's development trajectory, its position within shifting global orders, and crucially, whether green transitions deliver genuine improvements in wellbeing and ecosystem integrity for the hundreds of millions of people the region encompasses. Meeting these challenges demands sustained political commitment to democratic governance, labour rights, and environmental justice as non-negotiable components of green industrial strategies. The technical capacity exists; the political will to democratise power relations fundamentally constrains transformation. Building that political will requires sustained organising by labour movements, environmental activists, and social movements capable of maintaining pressure on state institutions and transnational corporations. Without this counter-power from below, developmental state capacities risk being mobilised for transitions that reproduce existing inequalities and ecological destruction beneath green branding.

The final analysis returns to fundamental questions of power and legitimacy. Southeast Asian governments face pressures from multiple directions: international financial institutions demanding liberalisation, multinational corporations seeking favourable investment conditions, the climate crisis demanding urgent transitions, and working populations requiring decent livelihoods. Reconciling these competing demands requires political leadership willing to prioritise genuine development and sustainability over narrow elite interests. This proves especially challenging given transnational corporate integration into Southeast Asian state institutions through corruption, revolving-door arrangements between government and business, and ideological commitment to neoliberal frameworks. However, historical precedents demonstrate that transformative change becomes possible when organised movements create sufficient political pressure for reform. Vietnam's revolutionary transformation, Thailand's labour movements, Malaysia's indigenous rights advocacy, and the Philippines' democratic transitions all involved sustained political struggle rather than elite goodwill. Progressive green industrial policy requires similar sustained movements capable of maintaining pressure on state institutions

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and multinational corporations. This report hopes to contribute to that essential struggle through documenting possibilities for state-led green transitions, revealing contradictions within current approaches, and identifying pathways towards genuinely just and sustainable industrial development.

Recommendations

Drawing on the analysis above, several priorities emerge for a progressive green industrial policy that advances both ecological sustainability and social justice in Southeast Asia. Firstly, strengthening independent labour protections and enabling genuine collective bargaining independent from state co-optation remains essential. Green industrialisation must embed labour rights as structural requirements, not optional supplements. This aim requires moving beyond formal frameworks towards active enforcement mechanisms and meaningful worker participation in monitoring and governance. Trade union independence, protection against victimisation, and genuine collective bargaining rights should be prioritised within green sector development policies.

Secondly, expanding mechanisms for democratic participation in industrial policy formulation beyond elite consultations between state bureaucracies, multinational corporations, and selected business associations is vital. Worker organisations, environmental activists, and affected communities must participate meaningfully in priority-setting for green transitions. This demands institutional innovations enabling participatory governance at national and regional levels, including meaningful representation in policymaking bodies rather than consultative window-dressing. Affected communities should have veto power over resource extraction and industrial projects impacting their territories, not merely consultation rights.

Thirdly, increasing technology transfer requirements with compulsory licensing provisions and substantial public research investment should be pursued vigorously. Technology transfer should not depend on corporate voluntary initiatives but instead be a binding condition for access to Southeast Asian markets and resources. This approach contrasts sharply with current regimes that privilege intellectual property protection over development needs. Regional cooperation mechanisms should coordinate technology policies to prevent competitive races to the bottom (Oqubay et al., 2020). Public research institutions should be strengthened to develop indigenous technological capabilities rather than remaining dependent on foreign firms.

Fourthly, enhancing enforcement mechanisms for environmental governance by moving beyond regulatory frameworks towards active monitoring, public participation, and meaningful sanctions for violations is essential. Enforcement must extend beyond formal-sector manufacturers to supply chains and informal-sector producers, addressing currently unregulated environmental externalities. Developing context-specific development indicators beyond GDP growth reflecting wellbeing, ecological health, and distributional outcomes would reorient policy evaluation away from conventional growth metrics (Noman and Stiglitz, 2017). Environmental impact assessments should be mandatory before industrial expansion, with meaningful community consultation and compensation for affected populations.

Finally, creating ASEAN-wide frameworks for joint technology development, coordinated labour standards, and environmental protection remains crucial to preventing a race to the bottom. Regional cooperation should enhance collective bargaining power against transnational corporations and Global North trade partners, enabling Southeast Asian countries to negotiate from a collective rather than an individual position within global value chains. South-South technology collaboration, particularly with India and China, provides alternatives to Global

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North-led intellectual property regimes. Harmonised labour standards across ASEAN would prevent capital flight to the lowest-wage jurisdictions and protect workers' collective rights.

Just transition frameworks, increasingly prominent in international climate discourse, deserve critical examination within Southeast Asian contexts. Global discussions of just transitions typically focus on coal miners and fossil fuel industry workers requiring retraining and income support during energy transitions. Nevertheless, Southeast Asian energy transitions co-occur with manufacturing expansion, creating complex labour dynamics in which declining fossil fuel sectors coexist with expanding green manufacturing. Workers displaced from coal mining lack guaranteed pathways into green manufacturing jobs; retraining programmes often teach skills that do not align with local job availability. Gender dimensions remain largely absent from just transition discussions, despite women constituting the majority of workforces in light manufacturing and green sectors. The family and community consequences of industrial transitions receive minimal attention despite their profound impacts on household survival strategies. Just transition frameworks must extend beyond income support for affected workers towards comprehensive restructuring of development pathways, ensuring transitions benefit working people and marginalised communities rather than merely substituting one form of exploitation for another. This demands substantial public investment in education, retraining, infrastructure, and social protection systems alongside coordinated industrial policy.

ASEAN institutions, despite a formal commitment to regional cooperation, have historically prioritised national sovereignty over coordinated action, thereby limiting their effectiveness in addressing problems that require collective responses. The ASEAN Comprehensive Investment Agreement and various trade frameworks have predominantly liberalised markets rather than coordinated development strategies. Green industrial policy, however, creates incentives for deeper coordination: harmonised standards reduce compliance costs for producers serving multiple markets; joint technology development platforms multiply individual-country research capacity; coordinated labour standards prevent capital flight to the lowest-wage jurisdictions. Indonesia, as the largest economy in Southeast Asia and the ASEAN chair, could lead the establishment of regional green industrial frameworks. Vietnam's technological sophistication in renewables could anchor regional knowledge platforms. Thailand's manufacturing expertise could support sectoral development elsewhere. Such cooperation would require moving ASEAN beyond rhetoric towards genuine institutional capacity for coordinated policymaking, a fundamental shift from historically fragmented approaches.

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1.7 Case study 7: The Paradoxes of Green Industrial Policy in Southern Africa

Overview

The resurgence of industrial policy discourse globally has generated significant enthusiasm for 'green industrial policy' as a vehicle for combining climate transition with economic development in the Global South. However, research conducted through a series of collaborative seminars with researchers, policy analysts, trade unionists and civil society actors across Southern Africa between November 2024 and September 2025 reveals fundamental paradoxes: while institutional frameworks for green industrial policy have become increasingly sophisticated, the actual implementation capacity and political will to deploy these frameworks remain severely constrained.

The past five years have witnessed the resurgence of industrial policy as a legitimate object of serious academic and policy debates. For decades, industrial policy had been effectively prohibited for developing countries through the architecture of international trade rules and the conditions attached to development finance (Chang, 2002; Rodrik, 2008; Stiglitz, 2010). The standard refrain from the International Monetary Fund and World Bank was that industrial policy was the policy 'that shall not be named': a relic of protectionism and import-substitution industrialisation that had purportedly failed and should be abandoned in favour of market-led development.

Consensus regarding the inappropriateness of industrial policy for development has shifted dramatically. The rise to power of governmental teams in the United States and European Union committed to state-directed industrial policy, combined with the rise of China as a world power and the urgency of climate transition, has rehabilitated supposedly green industrial plans and strategies as serious policy instruments. Suddenly, research centres and universities in the region and across the world are producing work on industrial policy at scales that would have been unthinkable a decade ago (Asiama et al., 2025). The language has changed from scepticism to enthusiasm.

However, the enthusiasm with which industrial policy is now discussed in Global North policy circles contrasts sharply with the cautious and often ambivalent reception it receives in the Global South. Here, industrial policy has become entangled with climate politics, development finance, and the question of who bears the costs and captures the benefits of economic transition. It is in this context that a series of collaborative research seminars was organised by TNI and the GreenPaths project across Southern Africa in 2024 and 2025, bringing together researchers, policy analysts, trade unionists, and civil society actors to interrogate the actual trajectories of green industrial policy implementation in the region.

Drawing on seminar transcripts with diverse social, political and institutional stakeholders, our analysis argues that the disconnect between policy ambition and political reality reveals something more profound than simple implementation failure. Instead, it demonstrates how green industrial policy can become a mechanism for legitimising continued extractivism and reinforcing subordinate positions within global value chains, unless grounded in transformative approaches to state capacity, democratic participation, and power redistribution.

Our case study identifies four critical paradoxes that must be confronted: the budget defunding paradox, the politics-policy disconnect, the extractivism contradiction, and the distributional question of who industrial policy actually benefits. These paradoxes are not technical problems requiring better policy design; they are fundamentally political questions requiring political solutions.

Our research demonstrates that the paradoxes identified in this investigation are not incidental or peculiar to Southern Africa, but rather reflect fundamental features of how green industrial policy has been conceptualised and implemented across the Global South in contexts of constrained state capacity, weak democratic participation, and entrenched power asymmetries. Addressing these paradoxes requires moving beyond technical solutions toward a genuine transformation of

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political structures and power relations. Without such transformation, green industrial policy risks becoming another mechanism for imposing the Global North's development agenda on the Global South, with benefits accruing to capital and costs borne by workers and communities.

Our research is situated within longer traditions of intellectual and political collaboration across the Global South. Such traditions have sometimes been marginalised by the dominance of Global North knowledge production, but remain valuable resources for thinking about alternative development futures. Our seminars represent not simply data collection for research purposes, but part of a broader project of solidarity research and South-South knowledge production aimed at strengthening the capacity of researchers, policy analysts, and civil society actors across the Global South to think critically about green industrial policy and to articulate alternative visions grounded in the interests and experiences of their own communities.

Research Questions

Our research investigation is structured around several central inquiries. How do institutional frameworks for green industrial policy become disconnected from political capacity and political will? How can green industrial policy function as a mechanism for continued extractivism and subordination rather than genuine transformation? Who benefits from industrial policy, and on what terms are benefits distributed? What political conditions and power configurations would be necessary to make green industrial policy genuinely transformative in the service of workers and communities rather than capital? How do the experiences of Southern Africa compare to industrial policy trajectories in Asia and Latin America? How might we reimagine green industrial policy through the lens of justice and participation, ensuring that diverse communities have a meaningful voice in policy design and implementation? These research questions emerged through collaborative consultation with research partners across the region, reflecting both academic concerns and practical challenges identified by policymakers, activists, and community leaders.

Underlying these questions is a fundamental proposition: the bottlenecks constraining green industrial policy lie not primarily in the technical or institutional policy domain, but rather in the political terrain. Genuine transformation requires shifts in power configurations, changes in the distribution of interests, and the political actors' will and capacity to challenge entrenched structures of extraction and subordination. Our research operates from the conviction that understanding these political dimensions is essential for developing effective responses to green industrial policy challenges in the Global South. Policy frameworks, however sophisticated, cannot overcome political constraints and the absence of genuine democratic participation and state autonomy. Addressing these challenges requires moving beyond technical solutions to engage fundamentally with questions of power, distribution, and political will.

Methods

Research Context and Institutional Partnerships

Our article draws on qualitative research conducted through a series of collaborative seminars organised by the Transnational Institute (TNI) and the GreenPaths project (https://greenpaths.info/) in partnership with several university-based research centres and think tanks. The seminars were designed as spaces for sustained dialogue among diverse research and policy communities, including academic researchers in development economics, political economy and environmental sciences; independent policy analysts and think tank researchers; government officials working on industrial policy, energy transition, and economic development; trade unionists and labour movement representatives; and civil society activists working on environmental protection, human rights, and social justice. Participant selection reflected deliberate efforts to bring together people working on green industrial policy from different disciplinary backgrounds and institutional locations.

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Three seminars were held at the University of Cape Town, the University of Johannesburg, and Stellenbosch University between November 2024 and March 2025. A fourth seminar was organised by TNI in Johannesburg in September 2025, in partnership with the Pretoria-based TIPS research centre and the TIDE Centre of the University of Oxford. Our geographical spread reflected deliberate efforts to engage with research communities across the region, while acknowledging that universities remain important sites of knowledge production and contestation, even in contexts where academic autonomy faces significant constraints. The diversity of individual participants, institutional backgrounds and expertise proved crucial, as it prevented the conversations from being captured by any single disciplinary frame or institutional interest.

All seminars operated under Chatham House rules, allowing open discussion without attribution of specific comments to named individuals. Our methodological choice was very appropriate, as it enabled participants to discuss sensitive political and policy issues, including criticism of government policies, analysis of corruption and state capture, and frank assessment of China's or Europe's role in African development, with greater frankness than might otherwise have been possible. Without Chatham House protection, some of the most candid and valuable discussions would likely not have occurred.

Horizontal and Collaborative Knowledge Production

The seminars operated explicitly on a principle of collaborative knowledge production rather than extractive research. Rather than researchers interviewing passive subjects or observing communities from a position of external authority, the seminars brought together diverse communities of practice with distinctive knowledge, experience, and analytical frameworks to collectively interrogate shared problems and think through potential solutions.

The conversations were structured around several key themes developed in advance through consultation with research partners: the conceptualisation of green industrial policy and its relationship to broader development objectives; the actual role of the state and state capacity in implementing industrial policy across different contexts; the distributive question of who benefits from industrial policy and on what terms; regional cooperation and collective capacity building in the Global South; and the intersection of industrial policy with extractivism, environmental protection, and democratic participation of civil society in policy design and implementation. Although these themes provided structure, the seminars explicitly rejected a rigid research instrument approach, instead operating on the principle of collaborative interrogation, where initial questions served as entry points for discussion rather than fixed frameworks. Some of the most important insights emerged when researchers and practitioners were given space to pursue lines of questioning rooted in their own experience and preoccupations.

Our approach reflected commitment to research grounded in the recognition that Southern African researchers, policy analysts, labour organisers and civil society activists possess both intellectual sophistication and practical knowledge that should genuinely inform research directions, conclusions, and recommendations. We operated from scepticism toward the typical pattern in which Global North researchers parachute into the Global South to study development problems, then return to Northern universities to publish analyses that often minimise or marginalise the knowledge and agency of Southern researchers and activists.

The theoretical frameworks used to interpret the conversations were drawn from critical political economy traditions: state capacity and autonomy theories; analyses of extractivism and neo-colonialism in development; scholarship on democratic participation and deliberation; and research on regional integration and South-South cooperation. However, these frameworks were held lightly, employed to interpret and organise emerging findings rather than as impositions that would constrain how participants could think and speak about their own contexts and experiences.

Our research forms part of a broader, ongoing research endeavour launched by TNI's Global Green Industrial Policy Lab within the Horizon Europe GreenPaths project, which involves the production of four comprehensive reports on industrial policy experiences in four regions: North Africa, Southern Africa, Southeast Asia, and Latin America. The Southern Africa seminars should

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be understood not as an isolated research exercise but as part of a comparative, multi-regional investigation of how green industrial policy is being conceptualised and implemented across the Global South.

Our broader context shapes our analysis in important ways. Our research brings a comparative perspective enriched by understanding how industrial policy is being pursued in other regions, what lessons emerge from Asia, Latin America, and other parts of Africa, and what patterns are common across diverse contexts. Connecting local research communities across regions facilitates the exchange of knowledge and experience that might otherwise remain isolated. Our research represents part of a broader project of solidarity research and South-South knowledge production aimed at strengthening the capacity of researchers, policy analysts, and civil society actors across the Global South.

Finding and Results

The Budget Defunding Paradox

One of the most striking observations to emerge from the seminars was the paradox of budget defunding. Research participants repeatedly noted that green industrial policy has become ubiquitous in policy discourse and has featured prominently in government frameworks, academic research, international development agendas, and the strategies of multilateral development banks (Asiama et al., 2025). Nevertheless, this discursive prominence coexists with the systematic defunding of the actual machinery of industrial policy at the state level.

Governments announce industrial policy frameworks and strategies with considerable rhetorical flourish. International institutions praise the sophistication of governance arrangements. Nevertheless, the actual fiscal allocation of resources to implement these strategies remains severely constrained. One seminar participant captured the contradiction with particular clarity: 'You can see green industrial policy everywhere except on the budget, even though that's not true of all countries. But, at the same time, the expectation is that green industrial policy can solve the problems of Mpumalanga's energy transition, where the aim is to essentially manage down coal and coal-based energy. People will lose jobs, but somehow industrial policy alone is expected to come in and solve those problems, create the jobs to replace those that would have been lost, and deal with the social and environmental spillovers that have been accrued over decades.'

A grotesque situation has thus emerged in which enormous expectations are loaded onto what green industrial policy can accomplish: solving unemployment, managing just transitions, creating new industries, and building productive capacity. The actual resources dedicated to industrial policy have been systematically reduced. Such defunding reflects broader patterns of austerity and fiscal constraint that have characterised macro-economic policy in much of Southern Africa and the rest of the Global South for the past two decades (UNCTAD, 2023). However, it also reflects the reality that industrial policy itself has never been a priority for the kinds of administrations and international institutions that have wielded significant influence over African economies. The rehabilitation of industrial policy rhetoric has not, in most cases, been accompanied by the rehabilitation of industrial policy finance.

In South Africa's coal transition in Mpumalanga, workers displaced from coal mining are offered access to reskilling programmes that lack adequate resourcing, economic diversification strategies that are poorly funded, and alternative employment opportunities that simply do not exist at the scale required (Bhorat et al., 2024). Seminar participants noted that the defunding of industrial policy reflects political choices about what matters. Mining communities affected by coal transition have been expected to absorb the costs of decarbonisation, while receiving minimal public investment in economic alternatives.

The budget defunding paradox connects directly to a broader crisis of financing mechanisms that emerged as a central concern at the TIDE-TIPS-TNI convening. Participants emphasised that the green transition is fundamentally shaped by entrenched power asymmetries in the control and

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deployment of financial flows. A recurring concern was the profound disconnect between those who control financial resources, primarily donors, multilateral development institutions, and governments in the Global North, and the communities in the Global South most affected by environmental degradation and economic transition. Civil society organisations are frequently compelled to align with donor priorities, compete with state institutions for scarce resources, or serve merely as implementers of externally defined programmes. Solutions require radical restructuring of both domestic and international financing systems: moving from donor-driven agendas and debt-based climate finance toward redistributive mechanisms such as progressive taxation, public investment, and mobilisation of domestic resources. Reframing financing for green transitions as redistributive justice recognises the ecological debt owed by industrialised nations and the right of Global South communities to determine their own development pathways.

The Politics-Policy Disconnect

The second paradox concerns the relationship between policy and politics. Contemporary policy literature typically treats these as analytically distinct domains. Policy analysis focuses on the design of institutions and instruments; political analysis examines the configuration of interests and power. However, the seminars revealed that analytical separation obscures a crucial aspect of green industrial policy in the Global South: the fundamental inadequacy of policy frameworks when political structures remain oriented toward different objectives. One participant raised the essential tension directly: policy without accompanying political transformation proves pointless. The formulation expresses something that policy professionals often avoid: the recognition that even well-designed policies, implemented by competent bureaucracies, will fail if the underlying political structures and power relations are oriented against them.

Resource governance and beneficiation present particularly acute problems. Across Southern Africa, governments have articulated sophisticated policies regarding critical minerals beneficiation, resource governance, and the relationship between resource extraction and domestic development. Zimbabwe established lithium export bans in 2022 with the explicit objective of ensuring that lithium processing would occur domestically rather than being exported as raw ore. The policy is politically intelligible and economically rational (Lebdioui and Riofrancos, 2025). Nevertheless, implementation has largely failed. Chinese firms dominate the sector; infrastructure remains inadequate; corruption and smuggling undermine export controls. Why? The answer cannot be found in policy design. Rather, it reflects the reality that powerful political interests, both domestic elites and transnational capital, benefit from continued extractivism and export of raw materials while mining communities and the environment bear the costs of extraction.

Changing this pattern would require shifting the balance of political power: strengthening labour organisations, empowering mining communities, constraining the influence of transnational capital, and increasing state autonomy. It would, in other words, require a political transformation. Much of the contemporary discussion of green industrialisation implicitly addresses the policy domain as a technical problem. The focus is on improving mining taxation systems, designing better contractual arrangements, and strengthening institutional capacity. These are important elements. However, they are secondary to the political question of whether governments actually possess the political will and support to subordinate capital's interests to those of workers and communities (Cherif and Hasanov, 2019).

Seminar participants raised particular concerns regarding Southern Africa's diverse political contexts. Several countries in the region are governed by what might be termed authoritarian regimes. In such contexts, the problem is not merely technical; it is fundamentally political. Democratic participation in policy design and implementation becomes impossible when political systems are not genuinely democratic. The politics-policy gap reveals that the bottleneck in green industrial policy lies outside the policy domain. The bottleneck is political. It concerns the distribution of power, the configuration of interests, and whether political actors have the will and capacity to challenge entrenched structures of extraction and subordination. Policy design must

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be grounded in a realistic assessment of political constraints and possibilities. It must ask not only 'what policy would be optimal?' but also 'what political conditions would be required to make policy effective?' Moreover, it must address a crucial question: 'What political work would be required to create those conditions?'

The Extractivism Paradox

The third paradox concerns the relationship between green industrial policy and extractivism. On the surface, the two appear to represent opposed orientations. Extractivism is associated with raw-material exports, limited value addition, and the subordination of development to the logic of capital accumulation in the Global North. Green industrial policy, by contrast, promises industrial development, value addition, and the subordination of resource use to environmental and social objectives (Hamouchene and Sandwell, 2023). The seminars, however, revealed a more troubling reality. Green industrial policy, as it has been conceptualised in much of the Global South, can function as a new form of extractivism, as some scholars term it, green colonialism.

The logic remains familiar: the Global South provides raw materials; the Global North processes and manufactures finished goods. The only difference is that the materials now support renewable energy rather than fossil fuel infrastructure. Critical minerals (lithium, cobalt, nickel, and rare earths) are essential for renewable energy technologies, electric vehicles, and battery storage. The Global North's renewable energy transition, therefore, depends on expanding critical minerals extraction in the Global South. In this sense, green industrial policy in mineral-producing countries can become a strategy for managing increased extraction in ways that appear environmentally and socially responsible, while maintaining the fundamental structure of subordination.

Seminar participants articulated the contradiction with particular force. One observed: 'It's extractivism versus extractivism, because the way critical minerals are extractable is very much extractivism as usual. Extractivism comes from the place of power within the global value system and the global geopolitical value system. So how does Africa, Latin America, and Asia shift the power dynamics, so that when we're talking about green extraction, we're not part of the same process?' Breaking with the logic of extractivism gets to the heart of the matter. Is it possible to imagine a green industrial policy that breaks with extractivism? Such a policy would focus on value addition, beneficiation, and the capture of mineral rents for deployment into diverse industrial sectors. It would prioritise domestic processing and manufacturing over the export of raw materials. It would ensure that the wealth generated from resource extraction is redistributed to workers and communities rather than accumulated by capital.

It would use industrial policy as a mechanism for structural transformation rather than for reinforcing existing hierarchies. Implementing such a policy would, however, require challenging the logic of global supply chains dominated by firms from the Global North, and increasingly by those from China. It would require that resource-rich countries refuse to accept the role assigned to them within global value chains. It would require regional cooperation at scales never yet achieved in Southern Africa. Furthermore, it would require that states possess sufficient political autonomy to pursue such strategies despite pressure from multinational corporations and international financial institutions. The extractivism paradox reveals that green industrial policy, unless explicitly grounded in an anti-extractivist political project, can become merely a more sophisticated mechanism for continuing subordination. Such an outcome is not inevitable. However, it is likely to be the default unless significant political work is done to reshape industrial policy toward genuinely transformative ends.

The Distributional Paradox

The fourth paradox is deceptively simple: industrial policy is never simply about economic efficiency or technical rationality. It is fundamentally about distribution, meaning who benefits

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and who bears the costs (Bhorat et al., 2024). Nevertheless, policy analysis often treats distribution as secondary, focusing instead on the technical question of how to increase productive capacity or build manufacturing sectors.

The seminars returned repeatedly to distributional questions. Who actually benefits from industrial policy? Who bears the costs? What are the mechanisms through which benefits are distributed and costs allocated? Consider a major investment in renewable energy manufacturing in a particular location. Such an investment might create employment. But at what wages? What are the working conditions? Are the jobs permanent or temporary? Are they available to local workers, or do they require skilled migrants? Who owns the manufacturing facility? Are profits retained in the country or remitted elsewhere?

Alternatively, consider the case of green hydrogen development in water-scarce regions of Southern Africa. Projects promise development benefits and employment. Yet they also represent massive water extraction in regions where water is increasingly scarce. Who benefits from the hydrogen production? Who bears the cost of water depletion? How are costs and benefits distributed between communities, national governments, and transnational corporations? Seminar participants noted that distributional questions are rarely central in policy discussions of green industrial policy. Instead, the focus is typically on aggregate economic metrics: growth rates, employment numbers, investment flows. However, aggregate figures can obscure deeply unequal distributions.

An industrial policy that creates substantial employment can still be regressive if the employment is concentrated in precarious, low-wage positions while profits are concentrated in capital ownership. An industrial policy that attracts significant foreign investment can still impoverish communities if the investment is structured to minimise local capture of rents. The gender dimension of industrial policy was highlighted as a particular concern. In renewable energy manufacturing, women tend to be concentrated in the lowest-paid, least secure positions while technical and management roles remain predominantly male. In mining communities affected by energy transition, women often bear disproportionate burdens of household economic destabilisation while having less access to alternative employment and reskilling opportunities.

Far from being incidental to industrial policy, the distributional question is fundamental. Industrial policy is always a choice about whose interests will be served and whose will be subordinated. It is a choice between development oriented toward workers and communities or toward capital accumulation. It is a choice about whether benefits will be widely distributed or concentrated in a few hands. Unless distributional questions are central to how we think about industrial policy, we risk developing sophisticated policy frameworks that ultimately serve to reinforce existing patterns of inequality and exploitation.

Main Results

The seminars generated extensive qualitative data documenting the perspectives, experiences, and analyses of over 45 researchers, policymakers, trade unionists, civil society activists, and community organisers from 22 countries across the Global South. Analysis of seminar discussions, conducted through a systematic review of transcripts and notes, identified four central paradoxes characterising the implementation of green industrial policy in the region. Our findings reveal fundamental disconnections between policy frameworks and political realities, between stated development objectives and distributional outcomes, and between rhetorical commitment to green transitions and actual resource allocation.

The methodological significance of conducting this research through collaborative seminars cannot be overstated. Rather than imposing external analytical frameworks on the region, the seminars allowed for dialogue-based knowledge production that reflected the lived experiences and analytical sophistication of researchers, policymakers, and activists working across Southern Africa. The diversity of participants ensured that emerging findings reflected not the views of any single institutional perspective or disciplinary frame, but rather a consensus that emerged across multiple communities of practice.

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One of the most methodologically significant findings concerns the gap between announced frameworks and lived implementation. Countries have shown considerable creativity in designing governance frameworks and policy instruments for green industrial policy. However, the actual fiscal allocation of resources to implement these strategies remains severely constrained. Industrial policy exists as a set of ideas and institutional arrangements, but lacks the financial sinews to become an effective practice. Analysis of these four paradoxes reveals that the problem with green industrial policy in the Global South is not primarily a problem of policy design or institutional innovation. Instead, the problem is the unwillingness of dominant political and economic actors to commit the fiscal resources required to make industrial policy effective. The following sections present the primary findings, organised around four critical paradoxes that emerged consistently across seminars held in partnership with universities and research centres across Southern Africa.

Discussion and Conclusions

Our research findings demonstrate that the disconnect between sophisticated policy frameworks and constrained political will is not simply a management problem that can be resolved through better coordination or improved communication. Instead, it reflects fundamental conflicts of interest between those who would benefit from a genuine transformation of development patterns and those who benefit from maintaining current structures of extraction and subordination. Understanding this dimension is essential for developing effective strategies for change.

The four paradoxes identified in our research are not incidental problems that can be solved with better technical solutions. They are fundamental features of how green industrial policy has actually been implemented in the Global South. They reflect the reality that, however sophisticated, policy frameworks cannot overcome political constraints or the absence of genuine democratic participation and state autonomy. Our findings are sobering. Across Southern Africa, implementation of even well-designed policy frameworks falls dramatically short of their ambitions.

South Africa's just transition framework presents a particularly instructive case. The Presidential Climate Commission (2022) articulated a comprehensive framework of policy objectives. Communities in Mpumalanga, the heartland of South African coal mining, report limited consultation with workers about their futures. Reskilling programmes exist but are frequently inaccessible or irrelevant to actual labour market opportunities. The stated commitment to a just transition coexists with coal plant closures that proceed without parallel investment in alternative livelihoods. The result is that workers and communities experience policies as inadequately resourced gestures rather than as comprehensive programmes genuinely committed to meeting their needs.

A broader observation emerged from the seminars: that industrial policy can only be as transformative as the political movement supporting it. Without powerful labour unions, community organisations, and civil society pressure, governments will typically align themselves with business interests. With such movements, governments can be pressured and constrained into adopting policies more aligned with workers' and communities' interests. Another dimension of the policy-practice gap concerns state capacity. Even when political will exists, states often lack the technical and administrative capacity to implement complex industrial policies effectively. Administering beneficiation requirements, conducting due diligence on mining contracts, managing development banks, and directing investment strategically all require significant state capacity that many Southern African countries struggle to maintain. Capacity deficits are themselves partially political. Decades of neoliberal austerity have systematically defunded state institutions, particularly in technical and administrative areas. Such movements represent the organised voice of those most affected by industrial policy decisions and possess the power to constrain governmental alignment with narrow business interests. Seminar participants consistently emphasised this fundamental reality.

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Underlying the implementation gap is a fundamental question of political will. Technically well-designed policy frameworks can still fail if political actors lack genuine commitment to implementing them. Enormous expectations are being placed on green industrial policy to meet economic and social objectives, in a context where industrial policy has been systematically defunded. If implementing just transition comprehensively would require significant state investment in economic alternatives to mining, such investment would necessarily reduce capital accumulation by mining companies and their owners. The question becomes: will governments privilege the interests of displaced workers and communities, or will they accept the subordination of social concerns to continued capital accumulation? The answer, as suggested by implementation evidence across Southern Africa, is sobering. Governments have frequently chosen the latter course. Mining and energy companies are permitted to proceed with closures and retrenchments without comprehensive transition support.

Comparative analysis with Asia and Latin America reveals important contrasts and commonalities. China and Indonesia have made more substantial state deployments of industrial policy than Southern Africa. However, these experiences reveal important limitations. China's overseas mining investment frequently subordinates local interests to Chinese capital, while Indonesian policy achievements coexist with significant negative externalities and contested distributional outcomes. In Latin America, where some countries maintain stronger traditions of state-led development and state-owned enterprises, the picture was more mixed. Brazil has articulated an ambitious industrial policy framework addressing multiple sectors beyond extractive industries. Chile's Codelco remains a significant state-owned copper producer, though the terrain of publicly-owned mining is contested. Mexico's recent decision to nationalise lithium represents an effort to reassert state control, though the capacity to translate policy decisions into effective industrial development remains constrained.

What emerged from comparative discussion was that no simple model exists that can be transplanted from one context to another. Industrial policy that works in the context of strong state institutions, significant domestic capital accumulation, and particular labour force characteristics may not work in contexts with weaker institutions and different structural conditions. Yet, the comparison also revealed that what is possible in Asia and Latin America is not, in principle, impossible in Southern Africa. The constraints are political more than structural. Our project demonstrates that researchers, policy analysts, civil society actors, and some progressive government officials understand these stakes and are committed to struggling for transformative approaches. Whether such struggles will prove successful remains an open question. What is clear is that incremental reforms to policy frameworks, without accompanying transformations of political power and state capacity, are unlikely to deliver the combination of climate transition and genuine development that the region requires.

Who Drives Industrial Policy? The Question of Actors and Coalitions

One theme that emerged throughout the seminars was that industrial policy cannot be analysed simply as state action. Rather, it involves a complex constellation of actors: private firms, state-owned enterprises, development banks, labour organisations, civil society organisations, and international institutions. Each group possesses distinctive interests and varying degrees of power.

A participant framed this challenge with particular clarity: 'Who are the actors? Who's going to drive this? One analogy I think is quite useful is that every country wants to put on this play, this production, or make a movie. But who are the actors? Do you have private capital, whether it's domestic or foreign, that's aligned? Do you have public capital aligned?' The implication is that policy frameworks are not self-executing. They require actual actors with power and interest in implementation. The question is which actors and what constellation of interests will dominate in determining how industrial policy actually unfolds.

One set of actors that emerged as increasingly important across discussions was development banks and development finance institutions. The role of development banks is critical in this space, as they are influential actors that can navigate the relationships among the public, the state,

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and the private in a developmental way. Rather than relying on private foreign direct investment or state budgets, development banks can serve as intermediaries that mobilise capital, direct it toward strategic objectives, and maintain some degree of public accountability. Seminar participants noted that the capacity of African development banks to finance green industrialisation remains underdeveloped. While the World Bank and other multilateral development banks deploy substantial resources, they typically come with conditionalities constraining policy autonomy. Strengthening African development banks, giving them the capacity and autonomy to finance industrial development in line with regional priorities, emerged as important in seminar discussions.

Labour, Civil Society, and Counter-Hegemonic Coalitions

If industrial policy is to serve worker and community interests rather than capital interests, then labour organisations and civil society movements become crucial actors. Yet across Southern Africa, labour movements have weakened considerably over recent decades, as a consequence of deindustrialisation, structural adjustment, and deliberate state and capital suppression of labour organising. Rebuilding labour power emerges as a precondition for transformative industrial policy. Worker participation in state institutions governing industrial policy; worker veto power over major industrial investments; worker ownership of enterprises; collective agreements establishing wages, working conditions, and profit-sharing arrangements, all require labour movements capable of exercising significant power.

Similarly, civil society organisations focused on environmental protection, land rights, and community wellbeing become important actors in constraining industrial development that would otherwise proceed on terms dictated purely by capital. Mining-affected communities, environmental organisations, and human rights activists can provide a counterweight to pressure from corporations and governments oriented toward rapid capital accumulation. One dimension that emerged as potentially significant across the seminars was regional cooperation. Several participants noted that individual countries in Southern Africa, even relatively industrialised ones like South Africa, lack the scale and productive capacity to shape their own development in the face of global capital flows and integrated value chains. However, if Southern African countries could coordinate their industrial policy strategies, they might collectively possess greater autonomy.

The Southern African Development Community (SADC) has articulated frameworks for regional cooperation on energy transition and green industrialisation. The SADC Renewable Energy Strategy and regional cooperation around critical minerals beneficiation represent gestures toward such coordination. Nevertheless, implementation remains limited, constrained by insufficient funding, inadequate institutional capacity, and the difficulty of coordinating policies across countries with different economic structures and political interests. Seminar participants suggested that more ambitious regional cooperation would be necessary to genuinely challenge subordinate positions within global value chains. Coordinated mineral processing standards that require processing within the region rather than exporting raw ore, collective requirements for technology transfer as conditions for market access, and explicit governance structures ensuring that workers and communities have a voice in regional industrial policy decisions would strengthen collective bargaining power.

The vision that emerged was not of a regional bloc pursuing isolationist development, but rather of Southern African countries using regional coordination to enhance collective bargaining power vis-à-vis transnational capital and international institutions. Regional cooperation would be a mechanism for building the scale and productive capacity necessary to dictate terms to capital rather than accepting the terms that capital offers.

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The seminars were part of a broader research initiative examining green industrial policy experiences across diverse regions of the Global South. Participants drew on research and knowledge from other regions to contextualise the Southern African experience. Regarding Asia, particularly China and Indonesia, what emerged was a picture of much more substantial state deployment of industrial policy compared to Southern Africa. China has made massive investments in critical minerals processing and manufacturing capacity, both domestically and overseas, while Indonesia has attracted significant foreign investment in nickel battery production with notable state and domestic capital ownership. However, these experiences reveal important limitations. China's overseas mining investment frequently subordinates local interests to Chinese capital, while Indonesian policy achievements coexist with significant negative externalities and contested distributional outcomes. The critical questions remain unresolved: To what extent does state participation actually capture rents versus allowing transnational capital to dominate? Does the resulting employment prove secure or precarious? Does expanded processing capacity translate into broader industrial development that benefits workers and communities, or primarily enriches capital? These uncertainties underscore that scale and state involvement alone do not guarantee transformative outcomes.

Regarding Latin America, where some countries maintain stronger traditions of state-led development and state-owned enterprises, the picture was more mixed. Brazil has articulated an ambitious industrial policy framework addressing multiple sectors beyond extractive industries. Chile's Codelco remains a significant state-owned copper producer, though the terrain of publicly-owned mining is contested. Mexico's recent decision to nationalise lithium represents an effort to reassert state control, though the capacity to translate this political decision into effective industrial development remains constrained. What emerged from comparative discussion was that no simple model exists that can be transplanted from one context to another. Industrial policy that works in the context of strong state institutions, significant domestic capital accumulation, and particular labour force characteristics may not work in contexts with weaker institutions and different structural conditions. Yet, the comparison also revealed that what is possible in Asia and Latin America is not, in principle, impossible in Southern Africa. The constraints are political more than structural.

Recommendations

Addressing the four paradoxes requires what might be termed transformative green industrial politics: politics and policies grounded in deliberate efforts to enhance state autonomy, extend democratic participation, and use industrial policy as an instrument for redistributing power. What would such a policy look like in practice? Our seminars generated several consistent proposals, though it is important to note that these remain contested and subject to ongoing debate among researchers, activists, and policymakers.

First, rebuilding state fiscal capacity. Governments in Southern Africa must reclaim fiscal space through debt restructuring, mobilising domestic resources, and using monetary policy powers to direct development (UNCTAD, 2023). Such efforts may involve capital controls, exchange rate management, and the deployment of development banks to finance strategic investments. It requires treating fiscal space as a political choice rather than a technical constraint. The role of development banks is exceptionally important in this space, as they are influential actors that can navigate the relationships among the public, the state, and the private in a developmental way. Strengthening African development banks, giving them capacity and autonomy to finance industrial development according to regional priorities, emerged as important in seminar discussions.

Second, extending democratic participation beyond consultation. Current frameworks for stakeholder participation in industrial policy typically involve consultation and information-sharing. Transformative approaches would involve workers and communities exercising veto

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power over major industrial developments affecting their livelihoods. Such participation might involve worker representatives on state development agencies with genuine decision-making authority, community veto rights over extractive projects, and revenue-sharing arrangements giving mining communities direct control over development investments. If industrial policy is to serve worker and community interests rather than capital interests, then labour organisations and civil society movements become crucial actors.

Third, deploying state ownership as a developmental instrument (Chavez and Steinfort, 2022). Rather than accepting private ownership of strategic industries, states might use public ownership to ensure that industrial policy serves public purposes rather than private profit. Such approaches might involve state-owned enterprises in critical minerals processing, state participation in renewable energy manufacturing, and state direction of development finance toward strategic objectives.

Fourth, subordinating extraction to processing and manufacturing. Industrial policy should be oriented toward moving away from raw material exports toward processing, manufacturing, and value addition. Such reorientation requires refusing to accept the roles assigned to resource-rich countries within global value chains. It requires willingness to restrict or prohibit raw material exports in the absence of domestic processing. It requires regional coordination to ensure that no country undercuts others by accepting less advantageous terms.

Fifth, prioritising domestic and regional markets. Instead of orienting industrial policy purely toward export markets, states might prioritise production for domestic consumption and regional trade. Such approaches require creating regional market integration, harmonised standards, and coordinated tariff policies that protect emerging industries until they reach competitive capacity.

Sixth, investing in worker and community capacity. Transformative industrial policy must prioritise investment in worker training, community productive capacity, and the development of worker-owned and community-owned enterprises. Such investment requires treating workers and communities not as passive recipients of development but as active agents capable of determining development directions.

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1.8 Case study 8: Green Industrial Policy in North Africa: Between Energy Sovereignty, Authoritarian Governance and Neocolonial Extraction

Overview

Green industrial policy in North Africa faces structural tensions between ambitious renewable energy targets and persistent patterns of neocolonial resource extraction. Drawing on case studies from Morocco, Tunisia, and Egypt, export-focused green hydrogen initiatives, privatisation agendas driven by international financial institutions, and the instrumentalisation of green infrastructure in occupied territories illustrate how energy transitions risk deepening dependency rather than promoting genuine sovereignty. Over the past decade, North African countries have emerged as continental leaders in renewable energy deployment, hosting nearly half of Africa's installed wind capacity and approximately one-fifth of grid-based solar capacity. Morocco aspires to achieve 52 per cent renewable energy by 2030, whilst Tunisia has set a target of 35 per cent, and Egypt has mobilised substantial expansion of renewable capacity.

North Africa's green transition reproduces historical asymmetries between the Global North and Global South through mechanisms of green extractivism and structural adjustment despite substantial renewable energy deployment. Progressive green industrial policy requires rejecting neocolonial frameworks, asserting resource sovereignty, democratising energy planning, and building South-South cooperation networks capable of countering Northern capital dominance. Without fundamental power restructuring, renewable energy risks becoming greenwash for ongoing exploitation. Beneath the veneer of environmental progress lies a more troubling reality: North Africa's green transition is unfolding amid significant global asymmetries that reproduce historical patterns of resource extraction serving external interests. These dynamics reveal how climate imperatives can be instrumentalised to serve neocolonial agendas, converting environmental necessity into a mechanism for reinforcing peripheral incorporation into global capitalist systems.

Research questions

Renewable energy transitions in North Africa, framed as climate action, merit scrutiny of their structures to serve Northern capital accumulation rather than regional development. Key questions include: How do export-focused green hydrogen projects reproduce historical patterns of resource extractivism that characterised colonial relationships? What mechanisms enable international financial institutions to leverage climate finance for privatisation agendas that subordinate energy transitions to financial sector profits? How do authoritarian governance structures exclude democratic participation and marginalised communities from energy transition planning? Can South-South cooperation networks and resource sovereignty frameworks offer viable alternatives to neocolonial dependency patterns that have historically constrained Global South development and perpetuated unequal exchange?

Methods

A critical political economy framework analyses green industrial policy in North Africa by synthesising government renewable energy strategies, World Bank Country Climate and Development Reports, International Monetary Fund programme documents, civil society monitoring reports from Western Sahara, and academic literature on green colonialism and energy extractivism. Neo-extractivism, structural adjustment, and democratic deficits serve as analytical

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dimensions for understanding how renewable energy transitions can paradoxically entrench rather than transcend dependency relations characteristic of Global South subordination to Global North capital. Southern perspectives and insights from engaged scholarship with anti-colonial social movements and policy networks across the region inform the analysis. Research explores energy transitions through the lens of political economy, examining ownership structures, capital accumulation patterns, technological dependencies, and democratic governance deficits that shape renewable energy expansion across North Africa.

Findings and results

North Africa's Renewable Energy Transition: Context and Asymmetries

North Africa constitutes Africa's largest energy market with relatively advanced infrastructure and universal electricity access except in Sudan and Libya. Vast renewable energy potential substantially exceeds current deployment levels. Over the past decade, North African countries have attracted significant international financing for renewable energy assets, primarily through auction-based mechanisms in Egypt and Morocco, with utility-scale wind and solar as the primary beneficiaries. Egypt and Morocco together account for more than two-thirds of Africa's installed wind and solar capacity, reflecting their position as leading renewable energy developers on the continent. Morocco's installed renewable capacity reached approximately 12 gigawatts by 2025, with around 5.4 GW actively generating from renewables. Egypt targets 25.1 GW of renewable capacity by 2030, while Tunisia aims for a comprehensive transformation of its energy sector through renewable energy. Morocco's Noor Ouarzazate Solar Complex represents the world's largest concentrated solar power plant, symbolising the region's technical and infrastructural capabilities for renewable energy deployment.

However, this expansion requires contextualisation within the context of global asymmetries. North Africa auctioned 4.8 GW of renewable capacity between 2014 and 2023, far behind Latin America's 44 GW annual average or China's 45 GW, despite possessing 22 to 26 per cent of the world's solar radiation. The gap between North Africa's renewable resource endowment and actual deployment levels reveals how structural constraints, financing limitations, and policy frameworks oriented toward foreign rather than local benefit limit renewable energy development. The transition is driven less by autonomous North African development strategies than by external demand from wealthier economies. The European Union's hydrogen strategy explicitly positions North Africa as a supply zone, creating a structural dynamic whereby North African resources flow northward to meet European energy security objectives. Geographical reorientation of energy flows from South to North reproduces colonial-era patterns of resource extraction, updating mechanisms of accumulation to align with contemporary climate imperatives whilst maintaining fundamental relationships of subordination between resource-rich peripheries and wealthy centres of capital accumulation. Energy transitions occurring within these structural constraints reflect enduring patterns of unequal exchange and peripheral incorporation into capitalist systems organised around Northern advantage.

Export-Oriented Green Hydrogen: Reproducing Historical Extractivism

Morocco's green hydrogen ambitions exemplify how renewable energy transitions can reproduce rather than transcend extractivist patterns. In March 2025, Morocco approved green hydrogen projects worth $32.8 billion, selecting five investor consortia for six projects across three southern regions focused on green ammonia, synthetic fuels, and green steel production targeting European

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markets. The ORNX consortium (United States' Ortus, Spain's Acciona, Germany's Nordex) will produce green ammonia; the UAE's Taqa, partnered with Spain's Cepsa, will produce ammonia and synthetic fuel; Morocco's Nareva will produce ammonia, synthetic fuel and green steel; Saudi Arabia's ACWA Power will produce green steel; whilst a consortium of Chinese firms (UEG and China Three Gorges) will produce ammonia. These six projects allocate up to 30,000 hectares per project, representing one of the world's largest renewable hydrogen development zones. The sheer scale of land allocation signals Morocco's strategic prioritisation of hydrogen export production over domestic energy security and reflects how renewable energy policy has become dominated by global hydrogen demand forecasts rather than North African development priorities.

Germany's ongoing partnership with Morocco includes EUR 300 million in funding for green hydrogen development and long-term technological and financial linkages with European industrial interests. TotalEnergies targets 10 GW of clean electricity capacity in Guelmim-Oued Noun commencing in 2027, positioning France as a major stakeholder in Morocco's hydrogen infrastructure and ensuring that French capital captures substantial value from hydrogen production. Europe could receive 24 GW of renewable power through North African interconnections, with the Xlinks Morocco-UK project alone supplying 11.5 GW of generation and 5 GW of battery storage. Interconnections represent permanent infrastructure investments that orient North Africa's renewable resources toward European consumption, creating locked-in dependencies through physical infrastructure, long-term power purchase agreements, and institutional relationships that favour Northern access and limit future policy flexibility.

A structural dynamic reproduces colonial patterns in which resource-rich territories produce commodities for consumption by wealthy, distant markets. Where historical colonialism extracted minerals and agricultural products, green colonialism extracts energy and hydrogen, yet the fundamental relationship in which peripheral economies generate surplus value that flows to metropolitan centres remains unchanged. Morocco's hydrogen sector will generate employment and industrial activity, yet the extraction of value through profit repatriation, technology licensing fees, and intellectual property payments ensures that wealth creation remains concentrated in foreign multinational corporations and Northern governments securing energy supplies. Foreign corporations own hydrogen production facilities and enjoy long-term offtake agreements that ensure profitable returns, whilst Morocco receives royalties and tax revenues, subject to negotiation with powerful multinational corporations. Asymmetries become apparent when examining ownership structures and the concentration of wealth extraction in foreign hands.

Large-scale hydrogen production through electrolysis requires substantial water inputs, precisely in arid regions experiencing severe scarcity. Selected green hydrogen projects will require approximately 63 million cubic metres of water annually, according to the Saharawi Observatory for Natural Resources and Environmental Protection. An enormous demand exists in regions where pastoral communities, agricultural production, and human settlements already face acute water stress. Desalination for hydrogen production exacerbates water stress, depleting fragile aquifers and increasing energy demands for water extraction. Concentrated solar power plants like Ouarzazate demand significant cooling water in semi-arid regions, competing directly with local needs for agricultural irrigation and domestic consumption. Environmental costs are socialised by imposing water scarcity on vulnerable populations, whilst profits are privatised through revenue capture by foreign corporations and Northern governments, replicating patterns of environmental injustice familiar from fossil fuel extraction, where pollution and resource depletion concentrate in Global South territories whilst benefits accrue exclusively elsewhere.

The European Union's institutional approach to North African renewable energy reveals structural contradictions inherent in the bloc's energy security strategy. Following Russia's 2022 invasion of Ukraine, the EU fundamentally reoriented its energy geopolitics, elevating North Africa from a peripheral energy concern to a strategic priority for diversifying supply chains and reducing fossil fuel dependence. However, simultaneously, this reorientation reproduces patterns of

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resource extraction that prioritise European energy security over North African autonomous development. The EU increasingly frames North Africa as a supply zone that meets European climate targets rather than as a region that requires energy sovereignty to serve North African populations. The proposed SoutH2 Corridor, a 3,300-kilometre hydrogen pipeline connecting Algeria and Tunisia through Italy to Austria and Germany, exemplifies this dynamic by delivering more than 40 per cent of the EU's 10 million-tonne hydrogen import target by 2030, positioning North African production capacity as essential infrastructure for European industrial decarbonisation. Expert analysis reveals fundamental misalignments between EU ambitions and North African production realities: neither Algeria nor Tunisia currently produces green hydrogen in commercially meaningful quantities, and achieving 2030 export timelines requires technological breakthroughs characterised as 'highly ambitious' and subject to significant delays. EU Carbon Border Adjustment Mechanism, introduced in 2023 and fully operational from 2026, imposes carbon levies on imported cement, iron and steel, aluminium, fertilisers, electricity, and hydrogen, positioning emissions intensity as a competitive barrier against North African industrial exports. Although theoretically incentivising clean energy adoption, CBAM effectively creates tariff barriers against industrial products manufactured with non-EU electricity, potentially disadvantaging North African industries seeking to develop value-added manufacturing from renewable energy. A framework prioritising EU industrial competitiveness over North African industrial development replicates historical patterns in which the Global North imposes environmental standards that constrain Southern industrialisation. The Global Gateway Investment Package's EUR 150 billion allocation to Africa (2021-2027) simultaneously signals a commitment to regional infrastructure development and reveals the limited scale of institutional support relative to actual investment requirements. Whilst substantial in nominal terms, current EU allocations remain marginal relative to North Africa's development needs, forcing North African governments to accept private-sector financing on extractive terms or pursue bilateral partnerships with individual EU member states pursuing narrowly defined national interests.

Western Sahara: Green Colonialism Under Military Occupation

Green extractivism's starkest manifestation emerges in Western Sahara, where more than 80 per cent of Moroccan government land designated for renewable energy and hydrogen projects is located in occupied territory. Morocco plans to develop 553,435 hectares for Dahamco's green hydrogen and ammonia facility in Dakhla-Oued Eddahab, 150,446 hectares for Falcon, and 145,333 hectares for the ORNX consortium in Boujdour, according to the Saharawi Observatory for Natural Resources and Environmental Protection. By 2030, projections indicate that 47.20 per cent of Morocco's total wind capacity and 32.64 per cent of solar capacity will be produced in occupied territory. Bou Craa phosphate mining complex sources 100 per cent of its energy from 22 Siemens wind turbines at the 50 MW Foum el Oued wind farm, directly linking renewable infrastructure to extractive operations in occupied territory and demonstrating how green energy serves not decarbonisation but rather the expansion and consolidation of extraction in territories under illegal occupation, converting climate action into occupation infrastructure.

Installed renewable capacity generates approximately $1.95 billion annually for Morocco, integrated into the national grid and exported internationally. Critically, the Saharawi people see no benefits from resources extracted from their territory. Instead, Moroccan authorities engineer demographic shifts by relocating settlers into energy sector employment, whilst Saharawi communities face displacement, arbitrary arrests, and systematic exclusion from economic opportunities. A contemporary form of green colonialism exists in which renewable energy infrastructure consolidates occupation by incorporating occupied territory into Morocco's national economic structures. Morocco plans to double Western Sahara's green power capacity from 1.3 GW to 2.7 GW by 2027, with $2.1 billion investment advancing 2030 World Cup infrastructure

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projects, with the acceleration of renewable energy development signalling Morocco's strategic use of green energy to entrench occupation, lock in resource dependencies favouring continued control, and create material stakes for foreign investors in maintaining the occupation status quo.

International complicity enables green colonialism extensively. Foreign corporations from France, Spain, Germany, the United States, and China reap profits whilst international financial institutions and climate frameworks provide legitimacy. France committed EUR 10 billion during President Macron's October 2024 visit to Morocco for broader infrastructure development, including renewable energy projects in both Morocco proper and occupied Western Sahara territories such as Dakhla and Guelmim-Oued Noun. The French Development Agency granted EUR 150 million for renewable energy development in occupied territory, representing tacit endorsement of renewable energy projects in a territory whose international status remains disputed under UN auspices. UAE invested $25 billion and Saudi Arabia $2.8 billion between 2016 and 2025, with Gulf capital seeking long-term returns from a region positioned as a future energy export hub. Multiple state and corporate actors create a coalition of interests supporting Morocco's consolidation of occupation through renewable energy infrastructure, making a divergence from this trajectory increasingly difficult. EU failure to distinguish between renewable energy sourced from occupied versus Moroccan territory, coupled with the UN Framework Convention on Climate Change's acceptance of Morocco's reporting of Western Sahara projects as national commitments, grants international legal recognition to projects that violate international law. International climate frameworks become instruments for legitimising territorial appropriation and consolidating occupation, whilst Saharawi refugees displaced to climate-vulnerable desert regions are excluded from global climate governance structures. International climate processes celebrate North African renewable energy expansion as climate progress, whilst beneficiaries include occupation authorities, multinational corporations, and wealthy nations importing energy, whilst Saharawi populations bearing primary climate impacts are excluded from benefit distribution and decision-making processes affecting their territories and futures.

Privatisation and International Financial Institutions

North Africa's green transition is substantially shaped by the International Monetary Fund and World Bank's structural adjustment frameworks, which mandate privatisation whilst constraining state capacity for autonomous energy planning. Tunisia's transition, supported by the World Bank since 2018, aims for 35 per cent renewables by 2030 and 100 per cent by 2050, with two-thirds of the programme structured through public-private partnerships. Public-private partnership models, presented as optimal for resource allocation and risk distribution, actually transfer public assets to private corporations whilst socialising risks through government guarantees and subsidies from development finance institutions. In January 2023, Tunisia launched tenders for 1,700 MW, including ten photovoltaic plants of 100 to 150 MW and eight wind farms of 75 MW. $932 million ELMED project linking Tunisia and Italy's electrical grids received $337 million in European Commission funding and $268.4 million from the World Bank. Submarine cable infrastructure represents the permanent integration of Tunisian electricity systems into European markets, creating institutional lock-in that favours European access to North African renewable resources and limits future policy autonomy.

In November 2025, the World Bank approved $430 million financing package through the Tunisia Energy Reliability, Efficiency, and Governance Improvement Program to support renewable energy deployment and utility modernisation. The programme aims to mobilise $2.8 billion in private investment to develop 2.8 gigawatts of new solar and wind capacity by 2028, expected to generate over 30,000 jobs, primarily during construction. Emphasis on 'private investment

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mobilisation' reveals how development finance institutions frame renewable energy expansion as inherently requiring privatisation and absorption of foreign capital. Job creation figures emphasise temporary construction employment rather than stable operational positions, reflecting the temporary and precarious nature of benefits to local populations from energy infrastructure development controlled by external actors.

Egypt's 2014 energy sector reforms, supported by a $3.15 billion World Bank development policy loan, transformed the sector through feed-in tariff policies, competitive bidding frameworks, and fuel subsidy phase-outs. Reforms mobilised $2 billion in private investment in Benban Solar Park, organised through an International Finance Corporation consortium with $210 million Multilateral Investment Guarantee Agency political risk insurance. Political risk insurance represents an explicit guarantee that foreign investors will be protected against sovereign risk, effectively placing Egyptian public resources behind foreign capital accumulation and limiting government policy flexibility. Egypt's 2024 Green Hydrogen Incentives Law and National Council for Green Hydrogen explicitly target removing barriers to private investment, whilst the World Bank Country Climate and Development Report calls for increased private-sector participation.

Egypt continues to advance its renewable capacity within privatised frameworks significantly. As of 2025, 32 Power Purchase Agreements have been signed with private developers to generate 1,465 megawatts of renewable energy, with additional agreements underway. Egypt's Ministry of Planning allocated EGP 136.3 billion to electricity and renewable energy in 2025-2026, nearly doubling the previous year's investment and targeting renewables to account for 20 per cent of power generation by 2026, up from 12 per cent in 2024. Substantial investment occurs within frameworks in which foreign corporations capture value chains and profit streams whilst Egyptian populations bear financial burdens through electricity price increases and subsidy reductions. Egypt's first utility-scale battery energy storage system, a 300 MWh facility, commenced operations in July 2025, fully integrated with AMEA Power's 500 MW solar PV plant. Battery storage technology, essential for grid stability with high renewable penetration, remains controlled by foreign corporations, creating permanent technology dependencies and perpetual rent extraction.

Tunisia's energy sector restructuring, mandated by International Monetary Fund Resilience and Sustainability Trust reforms, requires unbundling the state electricity company STEG to enable European investor entry. Although framed as technical efficiency improvements based on neoliberal economics, reforms fundamentally reshape property relations, extracting public assets and converting them into vehicles for private accumulation. Unbundling creates sacrifice zones in which certain regions receive minimal investment, whilst foreign corporations capture value chains and extract monopoly rents. Privatisation patterns demonstrate what the Arab Reform Initiative terms 'green structural adjustment,' in which loans and investments favour foreign markets over local needs, potentially turning North Africa into a renewable energy exporter whilst domestic energy security remains fragile. Citizens in privatised energy systems typically face rising electricity costs, reduced access for low-income households, and minimal influence over investment priorities or infrastructure placement. Winners of the green transition include European energy importers securing hydrogen and renewable power supplies, multinational corporations capturing value chains and monopolising technology, the Moroccan monarchy through Nareva's wind portfolio, international financial institutions expanding lending portfolios and influence, and Gulf capital seeking long-term returns on green infrastructure. Losers include local and pastoral communities displaced without compensation, precarious workers in export-focused sectors, Saharawi people denied access to territorial resources, North African citizens paying for privatisation through higher energy costs, and civil society organisations facing limited participation in energy planning.

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North Africa's green transitions proceed within authoritarian governance contexts, excluding democratic participation and systematically prioritising foreign investment over public interest. Tunisia's energy sector governance reflects regional patterns in which centralised, non-transparent decision-making prioritises attracting foreign investment over local development. Energy policy decisions are made through technical committees dominated by World Bank consultants and Ministry officials, with minimal public consultation and accountability. Egypt's Benban Solar Park, despite mobilising substantial international investment, continues facing persistent challenges in ensuring equitable benefit distribution and community participation. Local populations near Benban reported inadequate consultation and minimal employment opportunities, with most project jobs going to experienced workers from elsewhere in Egypt or foreign technicians. Morocco's renewable energy expansion takes place without significant consultation or consent from the Saharawi people, with occupation authorities imposing projects unilaterally on territories whose populations lack decision-making power.

Governance deficits fundamentally undermine the potential for just transitions. Authoritarian structures exclude civil society participation, criminalise community consultation, and suppress labour organising around energy issues. Without reforming governance to serve public rather than private interests and establishing robust labour policies ensuring local employment, investments generate temporary foreign labour rather than long-term community benefits. Renewable energy investments theoretically generate 2 to 5 times more jobs per unit than fossil fuels, yet potential fails to be realised absent enabling labour market policies, technical training programmes, and democratic decision-making structures centred on justice. Energy transitions imposed through technocratic frameworks typically benefit international capital and local elites whilst reproducing marginalisation of working-class populations and local communities dependent on land for survival. Progressive green industrial policy requires rejecting export-focused hydrogen frameworks and redirecting renewable energy toward domestic industrialisation and regional development, prioritising domestic renewable deployment over exports until local decarbonisation reaches 60 to 70 per cent. North Africa's vast renewable potential should serve North African development needs: electrifying rural areas lacking electricity access, industrialising value-added manufacturing and processing sectors, and transforming agriculture through renewable-powered irrigation and agro-processing infrastructure. Rather than meeting European energy demand through hydrogen export corridors, renewable resources should address North African development objectives and poverty reduction by rejecting export-oriented hydrogen strategies and redirecting investment toward integrated energy systems serving continental development and regional South-South cooperation, ensuring that renewable resources first address North African energy poverty and support sustainable industrial development. Domestic energy security must precede export orientation, ensuring that renewable resources first meet North African needs and support development priorities.

Main results

North Africa's renewable energy transition, whilst substantial in capacity deployment, reproduces rather than transcends neocolonial patterns. Export-focused hydrogen projects prioritise European capital accumulation over North African development. Privatisation frameworks are driven by international financial institutions that subordinate energy transitions to financial-sector profits. Occupation territories become sites for green infrastructure expansion, serving resource appropriation and territorial control. Authoritarian governance structures exclude democratic participation and marginalised community voices. Environmental cost socialisation is profound,

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as water stress and displacement burden vulnerable populations whilst benefits flow to foreign capital. Progressive alternatives rooted in resource sovereignty, energy justice, and South-South cooperation exist. Morocco's renewable energy potential, if oriented toward domestic industrialisation and regional development rather than European hydrogen supply, could support progressive green industrial policy centred on continental integration. Tunisia's renewable energy deployment could prioritise public ownership and democratic energy planning rather than World Bank-mandated privatisation. Egypt's renewable energy expansion could serve local development needs through publicly owned utilities and democratic governance. Alternatives require rejecting neocolonial frameworks and investing political will in asserting North African agency and development priorities.

Discussion and conclusions

North Africa's green transition illustrates how renewable energy deployment, absent fundamental power restructuring, risks reproducing rather than transcending neocolonial relations. Export-focused hydrogen strategies prioritise European security over North African development. Privatisation frameworks subordinate energy transitions to financial sector accumulation. Occupation territories become sites for green colonialism. Authoritarian governance excludes democratic participation. Environmental imperatives can be weaponised to serve geopolitical interests and capital accumulation rather than advancing genuine sustainability and justice for affected populations and ecosystems.

Alternatives exist. A progressive green industrial policy centred on sovereignty, justice, and South-South cooperation can harness North Africa's exceptional renewable energy potential to advance continental development and liberation. Climate change must be recognised as fundamentally a justice issue, with Global South nations bearing climate impacts yet bearing minimal responsibility for emissions, deserving material support to advance transformation. Local energy knowledge systems and community-based renewable energy development models offer alternatives to technocratic, export-oriented approaches dominating current policy frameworks.

Absent fundamental reorientation, renewable energy risks becoming greenwash for ongoing extraction and exploitation, where green labels obscure relationships of control and dependency between Northern corporations and Southern territories. Severe climate impacts facing North Africa, including intensified water scarcity, desertification, agricultural disruption, and displacement, require rapid energy transformation. Nevertheless, transformation must serve North African populations rather than distant European consumers or multinational capital pursuing profit maximisation.

Climate justice requires recognising Northern historical responsibilities for atmospheric carbon accumulation, ending neocolonial extraction patterns, democratising energy transitions, and empowering marginalised communities as decision-makers. Renewable energy potential, technical capability, and financial resources exist. What remains is the political will to centre justice over profit, sovereignty over dependency, and democracy over technocracy. Building such a will requires not technical solutions but political struggles by North African workers, communities, and social movements demanding that energy transitions serve liberation rather than reinforcing subordination to global capital structures. Renewable energy's destiny is to become either a tool for emancipation or a mechanism for updating exploitation to accommodate climate imperatives. Regional actors hold decision-making power regarding which trajectory North Africa pursues, requiring assertion of agency and resource sovereignty against Northern capital and international financial institutions.

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Recommendations

A progressive green industrial policy in North Africa requires an immediate reorientation toward sovereignty, justice, and regional development. First, resource sovereignty must be asserted through technology transfer requirements, local content mandates, and compulsory licensing, thereby replacing intellectual property monopolies that limit access to technology. North African economies must develop domestic renewable manufacturing capabilities rather than remaining permanent assembly locations for imported components. State investment in public renewable companies can compete effectively with multinationals whilst maintaining democratic accountability. Local manufacturing of solar panels, wind turbines, and battery storage would create stable, skilled employment and retain more value chain benefits within national economies. Technology transfer provisions in international agreements should require multinational corporations to establish training and research facilities in host countries, thereby building national technical capabilities rather than perpetuating long-term dependence on foreign expertise.

Second, Western Sahara occupation must end, and Polisario's representational authority must be recognised internationally through UN processes. Green infrastructure cannot legitimise territorial appropriation and illegal occupation of UN-listed non-self-governing territories. International climate frameworks must distinguish between renewable energy produced in occupied versus sovereign territory and refuse to grant international recognition to projects that violate international law and UN Security Council resolutions. Climate justice demands alignment with broader justice principles regarding self-determination and territorial sovereignty, establishing a crucial precedent that environmental progress cannot override human rights protections and colonial occupation.

Third, energy planning must be democratised through mandatory community participation, labour movement involvement, and the inclusion of civil society in decision-making. Energy constitutes a fundamental public good requiring democratic governance accountable to affected populations. Transitions imposed through technocratic frameworks serving financial interests generate neither justice nor sustainability. Energy democracy frameworks should ensure that affected communities have decision-making power over energy infrastructure development, location, and ownership structures affecting their territories and futures.

Fourth, international financial institution conditionalities mandating privatisation must be rejected as development conditions. Public utilities must be strengthened through transparent governance, workforce development, and integration with broader development strategies. Public ownership permits aligning energy transitions with public benefit rather than profit maximisation. Public utilities can prioritise universal energy access and affordability over shareholder returns, making energy a right rather than a commodity.

Fifth, climate debt must be demanded as grants rather than loans, accompanied by technology transfers and the cancellation of odious debt. Global North historical responsibility for atmospheric accumulation requires material recognition through resource transfers that enable just transitions. Wealthy nations that industrialised through fossil fuels bear responsibility for financing Global South energy transitions rather than imposing loan burdens.

Sixth, South-South cooperation frameworks must be built to enhance collective bargaining power against Northern capital and international financial institutions. African, Latin American, and Asian countries with extractive dependencies require coordinated strategies that assert resource sovereignty and reject conditionalities. Regional cooperation organisations could establish common standards for renewable energy development, preventing races to the bottom in

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environmental and labour protections. North Africa's renewable energy potential offers genuine pathways toward liberation and development if oriented toward justice, sovereignty, and democratic control rather than serving Northern capital accumulation and maintaining neocolonial subordination.

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1.9 Case study 9: Climate finance and its distribution in the EU

Overview

This case study investigates the extent to which the European Investment Bank (EIB), as implementer of the European Green Deal Investment Plan (EGDIP), delivers on the promise (as a policy-taker of the EU) of a 'just transition' across EU regions. Since re-branding itself as the world's first climate bank, the European Investment Bank (EIB) was nominated by the European Commission to help implement its bold European Green Deal (EGD) by mobilising €1 trillion over a decade for sustainable investment towards transition from 2021. As a policy-taker, the EIB supports EGDIP objectives, including, ensuring the transition is "just" —to avoid leaving people and places behind. However, cities and urban areas, associated with their greater contributions to climate change, may be better placed to obtain demand-based climate finance than their less urbanised counterparts—posing a potential challenge to a just transition. The cases study conducts an analysis of the regional distribution of EIB climate finance between 2021 and 2023, using original data on 646 green projects. Two hypotheses are tested: whether urban regions attract more finance per capita, and whether vulnerable regions (as measured by the Green Transition Vulnerability Index, GTVI) receive more support. Findings confirm that cities and their commuting areas receive significantly more climate finance, while vulnerable regions do not. This challenges the equity of the transition and raises questions about the effectiveness of current policy tools.

Research questions

The concept of a "just transition", referring to an idea that "no person or place is left behind" during a transition, emerged from trade union and environmental justice movements in the 1970s at the national and regional levels faced with potential job losses as a consequence of environmental regulations (UN, 2025). This concept has by now morphed into a global one, making reference to a multiplicity of potential causes of concern about injustice, including global inequalities in consumption and emission patterns. Finance is at the heart of discussions on the just transition, including its role as a means of alleviating peoples and places most negatively affected by transition policies.

A considerable literature now exists on how just transitions can be assessed, including considerations of distributional, procedural, recognitional and restorative justice. This case study focuses on distributional questions of the just transition from a regional perspective. Though climate change is borderless, the ways in which climate change affects regions can differ significantly. In addition, the implementation of transition policies may produce both positive and negative externalities—which may affect regions unevenly. For example, transition policies, by reshaping productive activities, will create new "green" jobs, whilst destroying jobs in fossil fuel industries, affecting regions unevenly.

In the EU, policymakers recognise that transition policies may concentrate the burdens upon specific regions—regions which might already be lagging behind—hence, transition policies are required to attempt to rectify these potential injustices. The EU's Just Transition Mechanism is one example, which aims to support regions most affected by the transition. The EIB, as implementor of the EGDIP, is tasked to support this policy (EIB, 2022).

However, there are potential challenges to a just distribution of finance at the regional level, identified as a "paradox" in a paper by Rodríguez-Pose & Bartalucci (2024). This paper presents a framework which attempts to capture the extent to which regions are unevenly vulnerable to the transition by creating an index, the "Green Transition Vulnerability Index" (GTVI, henceforth).

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To construct this, the authors consider both direct and indirect expected impacts of the transition on a region, in both the short and medium-term. Direct impacts include the phasing out of fossil fuel and carbon taxes, while indirect impacts include labour and capital reallocation in vulnerable sectors such as transportation, agriculture, energy, tourism and industry. Direct impacts (such as phasing out fossil fuel and related job losses) will unevenly affect those regions most dependent on coal-fired power plants—which tend to be located in lagging behind regions. As regards indirect impacts, increased factor mobility and reallocation of economic and social assets as a consequence of green technologies, employment and innovation will likely mean a trend towards regional specialisation, which might lead to greater concentration in cities and urban areas, and brain-drain from lagging behind and other regions. Hence, the impacts of the transition collectively may exacerbate pre-existing regional inequalities, with greater concentration of "green" opportunities in cities and urban areas.

This presents some challenges to a just transition—which could, theoretically, be ameliorated by a fairer distribution of climate finance. However, despite the EU's claims that the EGD will deliver a just transition, challenges remain from a regional perspective. For example, it has been documented that cities and urban areas, with their superior capacities around innovation and policy implementation, are significantly better placed to benefit from transition policies in general, including, obtaining climate finance (OECD, 2025; EIB, 2025). Considering that cities and urban areas are largely responsible for climate change (UNEP, 2025a), this poses a question around to what extent the transition is just. In contrast, other regions, including lesser urbanized, rural and potentially left behind, may struggle to reap benefits offered by transition policies and finance. Even worse, it may happen, as shown in other case studies within this project, that transition initiatives undermine sustainable livelihoods in rural areas, as perceived by their inhabitants. Among factors explaining their relative disadvantages vis-à-vis cities are:

- Centralization of some responsibilities (including water services and waste management);
- Austerity policies and their legacies;
- Prior lack of climate adaptation policies may lead to increased borrowing costs;
- High costs of reporting and monitoring the use of climate finance; the need for enabling frameworks at the national level;
- And, finally, the lack of local experts available to help facilitate climate projects.

Urban-centric views on climate innovation, focused on capital-intensive and high-tech solutions which are worse adapted to rural areas, may fail to recognise and preserve sustainable livelihoods in those areas.

In order to study this potential paradox, or, challenge to a just transition, we develop two, related research questions:

Since larger urban areas are associated with a greater responsibility for climate change and greater capacity to implement transition policies, an outcome whereby they receive greater climate finance per inhabitant poses a challenge to the promise of the just transition.

Given this, research question 1 is: do those regions with the largest urban areas attract more climate finance per inhabitant from the EIB?

Since the EGD has as a priority to not leave people or places behind, should climate finance not be more directed to those regions with higher GTVI, this would represent another challenge to a just transition.

Given this, research question 2 is: do those regions most vulnerable to the green transition attract more climate finance per inhabitant from the EIB?

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Methods

Before analysing the extent to which EIB climate finance can be considered just, considering its regional distribution across the EU by population living in urban areas and vulnerability to the green transition, we set out our approach to methodology and data collection. Our methods are mixed, including quantitative analysis of primary sources, combined with five anonymized interviews with EIB senior officers working on strategic direction and climate action were conducted in Luxembourg in 2024 and 2025.

Firstly, the way in which the EIB understands, and measures, climate finance requires explanation. For the EIB, "green projects" are those where any amount within a project as a whole is dedicated to "Climate Action and Environmental Sustainability". This, in turn, includes twelve areas linked to the EGD:

(1) Building greater resilience to climate change;
(2) Making homes energy-efficient;
(3) Promoting clean energy;
(4) Investing in smarter more sustainable transport;
(5) Striving for greener industry;
(6) Eliminating pollution;
(7) Protecting nature;
(8) Promoting a sustainable food system;
(9) Supporting investment in sustainable cities and regions;
(10) Greening the financial system;
(11) Leading the green change globally; and
(12) Ensuring a just transition for all (EIB, 2020).

The "climate finance" element within a green project is expressed as an amount of the total finance made, on which basis, the bank states the percentage of which a green project is climate finance. However, should a green project involve construction where only part of that construction is climate-efficient, the respective part of the activity will classify as climate finance (interview #5). We follow the EIB approach and consider the amount of finance specifically devoted to Climate Action and Environmental Sustainability within each project, expressed in euros per inhabitant, as obtained by EU regions.

The EIB does not provide an account of its climate finance by EU regions. Hence, these data needed to be compiled for this case study, which constitutes a significant contribution. To do so, we use the online annual databases of all projects funded by the EIB between 2021 and 2023 (EIB, 2021-2023). This period encompasses three years, from 2021, the first year included in the EIB Group Climate Bank Roadmap 2021-2025 (EIB, 2020), to 2023, the latest year with comprehensive information available at the time of the data collection. The EIB annual databases provide information on specific details of each project, including its signature date, financing type, contract amount signed, the amount corresponding to climate finance and a description of each project. For the period 2021- 23, the databases include a total of 1,304 green projects funded by the EIB. These green projects encompass a contract amount signed of €152.4 billion (bn), from which € 97.1 bn (63.7%) are specifically devoted to climate finance.

The next step is to track these green projects to identify their location. Because some projects are country-wide and, because some projects are awarded to entities such as SMEs across various plants, it is not always possible to identify which specific locations obtain EIB climate finance. However, based on the information available for each green project, we built a database collecting information on the specific location (e.g., city, region, municipality, town, village, or even, a factory or plant location). Our manual tracking of each green project facilitated our identification of the location of 646 out of the total 1,304 green projects funded by the EIB in the period. The remaining projects were unable to be assigned to a specific region (e.g., because they involve

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many regions or because they were not assigned to a specific location). These 646 projects comprised a total of €50.9 bn of climate finance, which amounts to over half of the total of climate finance disbursed by the EIB across the period. After having identified all locations wherever possible, we proceeded to identify the EU region to which the location corresponds, following the official NUTS regional classification used by Eurostat (2025a). We thereby obtain an amount of climate finance attracted by each EU region for the period 2021-2023. We calculate our dependent variable by dividing this amount by the population of each region (Eurostat, 2025b).

In order to examine research question 1, we use the population living in a "functional urban area" in each region as the independent variable. Eurostat (2025c) defines a functional urban area as the sum of a city (i.e. a densely populated area) and its commuting zone. A functional urban area includes thus a city and the surrounding cities, towns, villages and rural areas that are heavily economically dependent upon it. This provides a delimitation of the functional and economic extent of cities, which is appropriate for analytical purposes and facilitates consistent comparison across EU countries (Dijkstra et al., 2019). To calculate this variable, we first take the population in each EU functional urban area using Eurostat (2025d), corresponding to 2023, or the latest year available. For Austria, as information on population of functional urban areas is not available, we take the population of metropolitan regions instead (Eurostat, 2025e), and follow the same process. Next, we identify the NUTS region in which each functional urban area has its main city and calculate the total amount of population of all the functional urban areas corresponding to each NUTS region. Based on the population living in a functional urban area, we subdivide EU regions into four quartiles: quartile 1 consists of regions between where under 340,000 inhabitants live in a functional urban area to regions where functional urban areas are not present; quartile 2, which includes regions in which between 340,000 and 720,000 inhabitants live in a functional urban area; quartile 3, regions in which between 730,000 inhabitants and 1.5 million inhabitants live in a functional urban area; and quartile 4, regions in which over 1.5 million inhabitant live in a functional urban area.

To examine research question 2, we use as a second independent variable the value of the GTVI elaborated by Rodríguez-Pose and Bartalucci (2024) for each region. Information on the GTVI is available for 231 of the EU NUTS regions and corresponds to the year 2022. GTVI values are highest when regions are more vulnerable to the green transition, and lowest when they are less vulnerable. For Belgium, we calculate the GTVI at the NUTS 1 level, taking the average of Belgium's NUTS 2 GTVI calculated by Rodríguez-Pose and Bartalucci (2024) weighted by their population. Data on the GTVI is not available for regions in Lithuania and Luxembourg, and for outermost regions in France and Portugal. The variable ranges from 4.85 in Notio Aigaio, Greece, to -1.84 in Stockholm, Sweden. Based on the GTVI, we subdivide EU regions in four quartiles: quartile 1, from -1.84 to -0.93 (that is, the least vulnerable to the green transition); quartile 2, from -0,92 to -0.37; quartile 3, from -0.36 to 0.76; and quartile 4, from 0.77 to 4.85 (that is, the most vulnerable).

We incorporate two additional control variables into our analysis. First, to consider whether the quality of institutions in each region affects their obtaining climate finance, we use the European Quality of Government Index (EQI), produced by the University of Gothenburg (Charron et al., 2024). Information from the EQI, obtained from a large citizen survey on respondents' perceptions of the public sector, encompasses four dimensions: control of corruption; government effectiveness; rule of law and voice and accountability. In the EQI, the EU average is equal to 0, and positive (negative) values reflect a quality of government higher (lower) than the EU average. In this regard, we would expect that regions with a higher (lower) EQI may be more (less) well placed to obtain EIB climate finance. Based on their EQI, we subdivide EU regions in four quartiles: from those with the lowest quality of institutions (first quartile) to those with the highest (fourth quartile). Second, we consider the relative wealth of each region by taking its GDP per capita, obtained from Eurostat (2025f). This is measured in purchasing power standard (PPS), to

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account for price differences across EU countries, and is expressed by taking the EU average equal to 100. We use GDP per capita to control for the extent to which wealthier regions obtain more EIB climate finance than their poorer counterparts.

We proceed to carry out a descriptive analysis in which we correlate the amount of climate finance from EIB projects obtained by each region with its: 1) population living in a functional urban area, 2) GTVI, 3) EQI, and 4) GDP per capita. This descriptive analysis highlights the characteristics of EU regions that obtained greatest and smallest EIB climate finance. We then perform an econometric analysis where the dependent variable is the amount of climate finance from EIB projects in each region, the other four variables simultaneously being considered as independent variables. The econometric analysis isolates the effect of each independent variable from those of the others, permitting the testing of the relationship of each independent variable with the amount of EIB climate finance in each region, holding all else constant. This approach facilitates identifying which, if any, of the independent variables explain the amount of EIB climate finance obtained by EU regions, once the effects of all of them are simultaneously taken into account.

Findings and results

The distribution of climate finance from EIB green projects across EU regions between 2021 and 2023 was very unevenly spread, as can be seen at a glance in Figure 5. On average, EU regions obtained just over 100 euros per inhabitant of EIB climate finance during this period. This figure illustrates some interesting preliminary trends, most starkly, between regions in the West and East of Europe.

First, we can see that seven EU countries positioned in the West, North and South of Europe have regions that, generally speaking, obtained significant climate finance across the whole country. These countries have regions that obtained at least double the average (over 200 euros per inhabitant) whilst most of the other regions in these countries also obtained reasonable amounts of climate finance (with averages of at least 50 euros per inhabitant or more). Regions obtaining over 200 euros per inhabitant included some regions in France (Basse-Normandie, Nord-Pas-de-Calais, Alsace, Aquitaine, Languedoc-Roussillon and Île de France – in order from largest to smallest amounts); Italy (Sicilia, Liguria, Sardegna, Puglia, Friuli-Venezia-Giulia and Provincia Autonoma di Bolzano); four in Spain (Extremadura, Comunidad de Madrid, Castilla y León and Basque Country); Belgium (Région de Bruxelles-Capitale and Région Wallone); Sweden (Övre Norrland and Stockholm); Finland (Etelä-Suomi and Pohjois- ja Itä-Suomi) and in Ireland (Southern).

Other countries that also had regions obtaining over 200 euros per inhabitant differed in that most of the rest of the country obtained lower amounts (regions that did not obtain even 50 euros per inhabitant of climate finance). This pattern is the case for countries including Germany (three near large cities including Berlin, Stuttgart and Köln, and three in Bavaria - Oberbayern, Oberpfalz and Oberfranken); Greece (Notio Aigaio and Dytiki Makedonia); the Netherlands (Groningen), Denmark (Midtjylland) and Austria (Burgenland), Slovenia (Zahodna Slovenija) and Poland (Slaskie). Estonia and Cyprus, which both constitute a single NUTS 2 region, also attracted more than 200 euros per inhabitant.

In contrast, some 104 regions (out of 233 regions under analysis) either attracted no or little climate finance: 73 regions did not obtain any climate finance at all, whilst 31 regions only attracted up to 20 euros per inhabitant. Most of these regions are located in East Europe, and low or null climate finance was concentrated in Slovakia (all regions), most regions in Bulgaria, Croatia, Czechia, Hungary and Romania, and several regions in Poland. Regions not obtaining climate finance were also found in around half of German regions, most regions in the

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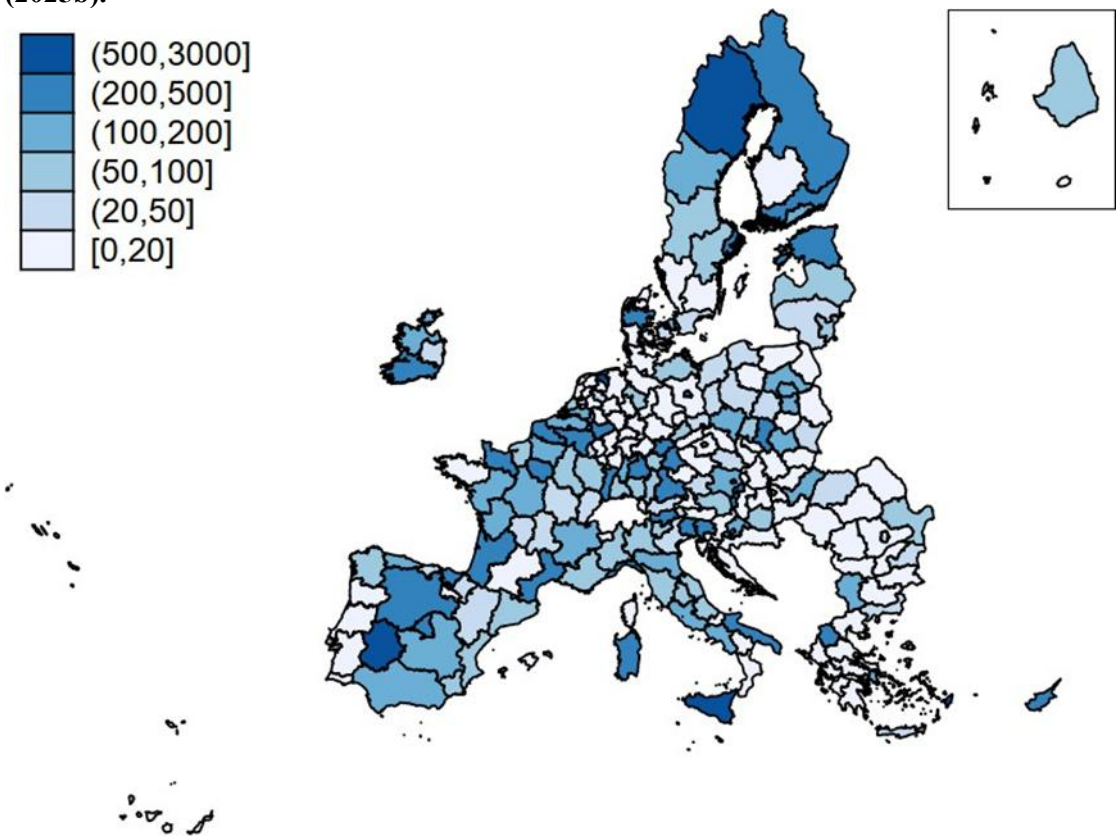
Netherlands, Portugal and Greece, and some regions in Austria (Kärnten, Salzburg and Voralberg) and Denmark (Syddanmark and Nordjylland).

Figure 5. Climate finance distribution from EIB green projects (euros per inhabitant) in 2021-2023, by region. Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b).



Henceforth, in both the graphs of the descriptive analysis and the econometric analysis, unless otherwise specifically stated, we use the variable on EIB climate finance per inhabitant in each region in logarithms to avoid large dispersion across regions. For operational purposes, we take the logarithm for regions where the amount of green finance from EIB projects is below 1 euro per inhabitant (including those where it is 0 euros per inhabitant) as 0.

Our first research question addresses if regions with the largest urban areas would attract more climate finance per inhabitant from the EIB. The correlation between EIB climate finance and the population living in a functional urban area in each EU region is shown in Figure 6. A clear, positive, correlation can be seen between both variables: regions with the largest populations across a functional urban area tend to obtain more climate finance. On average, for each additional million inhabitants living in a functional urban area, a region obtained +47.3% EIB climate finance.

Figure 7 shows the average amount of EIB climate finance obtained by EU regions classified into quartiles based on their population living in a functional urban area. As observed, regions in the fourth quartile (those with over 1.5 million inhabitants in a functional urban area, that is, large metropolitan areas) obtained significantly more climate finance than regions in any of the other quartiles. On average, regions in the fourth quartile attracted 154 euros per inhabitant, while regions in the other quartiles attracted 82.7 euros per inhabitant. Among the 58 regions in the

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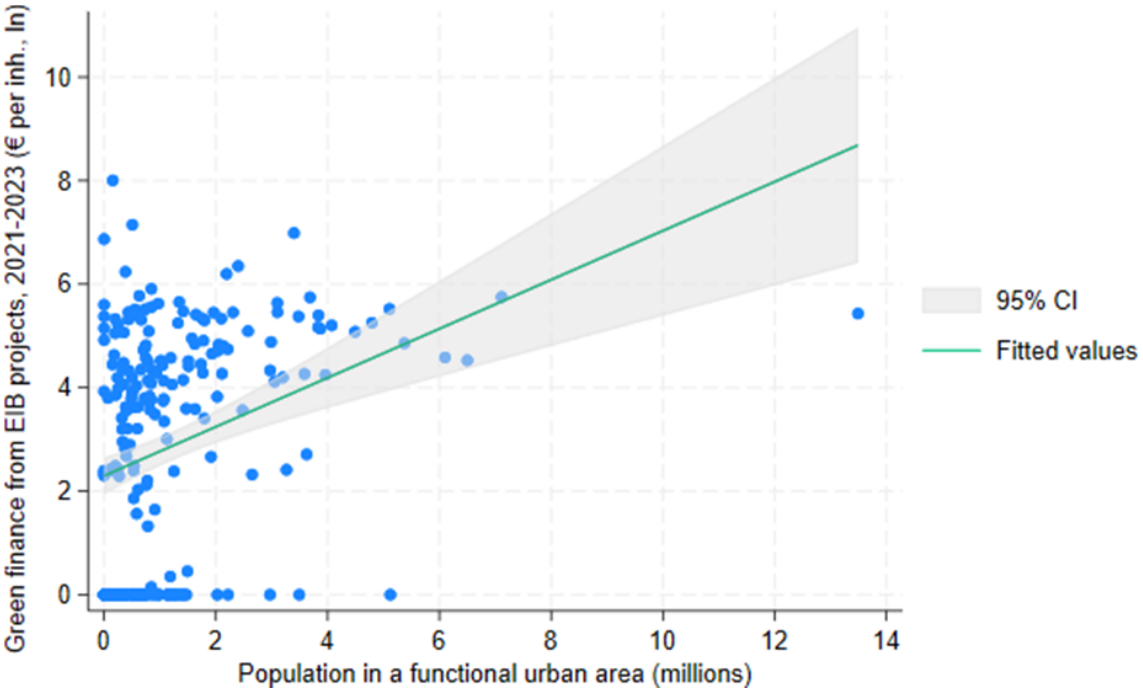
fourth quartile, 17 regions (29.3% of all the regions within this quartile) attracted more than 200 euros per inhabitant, 32 regions (55.2%) attracted between 20 and 200 euros per inhabitant and only 9 regions (15.5%) attracted less than 20 euros per inhabitant. In contrast, among the 175 regions in the other three quartiles, 21 regions (only 12% of all the regions within these quartiles) attracted more than 200 euros per inhabitant, 59 regions (33.7%) attracted between 20 and 200 euros per inhabitant and 95 regions (54.2%) attracted less than 20 euros per inhabitant.

Figure 6. Correlation between EIB climate finance and population living in a functional urban area



Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b, 2025d, 2025e and 2025f).

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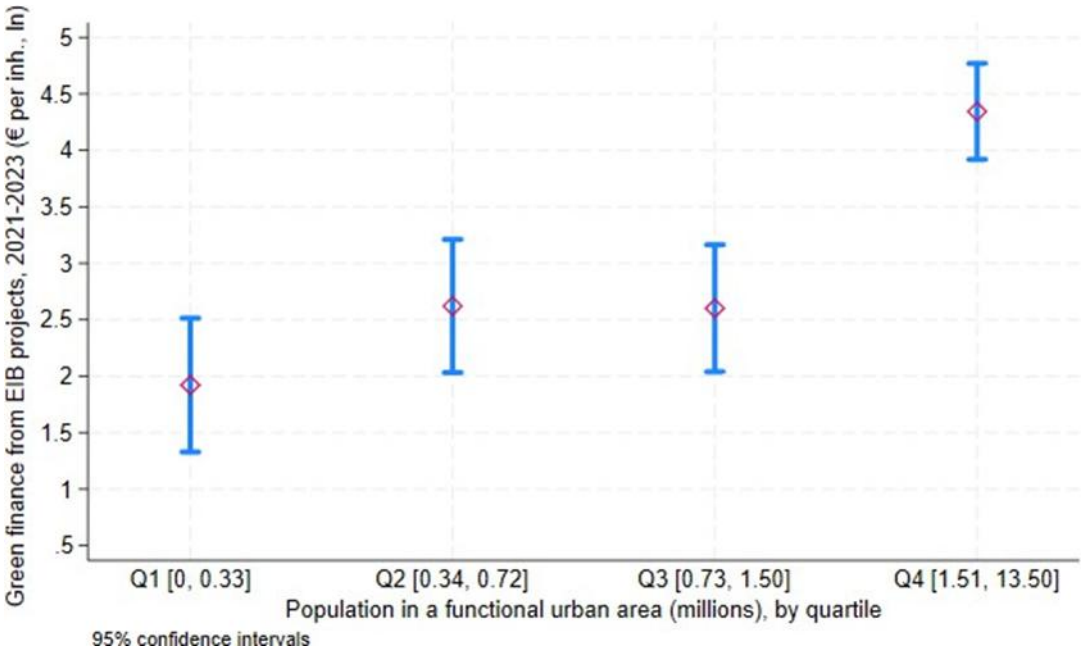
Figure 7. Climate finance from the EIB by quartiles of population living in a functional urban area



Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b, 2025d, 2025e and 2025f).

Table 8 lists the 25 EU regions with the largest population living in a functional urban area (over 3 million inhabitants) and the amount of climate finance from EIB projects obtained, respectively. On average, these 25 regions obtained 185.3 euros per inhabitant, nearly double the average of EU regions in the period (100 euros per inhabitant). In particular, fifteen of these 25 regions obtained more than the EU average. This is observed in most of the regions with the largest functional urban areas in France (Île de France, Rhône-Alpes and Nord-Pas-de-Calais), Italy (Campania and Lazio) and Poland (Mazowieckie and Slaskie), in Belgium (Région de Bruxelles-Capitale) and Greece (Attiki), and in several of the regions in Spain (Comunidad de Madrid and Andalucía) and Germany (Berlin, Köln, Oberbayern and Stuttgart). Many of these regions contain the capital city of EU states, while a region with a particularly large amount of funds (Région de Bruxelles-Capitale) contains the EU capital itself and most EU institutions an policymaking cores. Another six of these 25 regions did not obtain EU average climate finance amounts, but, nevertheless, obtained significant climate finance: Cataluña and Comunitat Valenciana, in Spain, Lombardia, in Italy, Provence-Alpes-Côte d'Azur, in France, Zuid-Holland, in the Netherlands, and Área Metropolitana de Lisboa, in Portugal. In contrast, just 4 of these regions with the largest population obtained under 20 euros per inhabitant: in Germany (Darmstadt, Düsseldorf and Hamburg) and the Netherlands (Noord-Holland).

Table 8. Amount of EIB climate finance obtained by the 25 EU regions with the largest population living in a functional urban area

Region	Population in a functional urban area (million inhabitants)	Climate finance from EIB projects (euros per inhabitant)
Île de France	13.49	228.3
Comunidad de Madrid	7.11	314.2
Lombardia	6.50	92.5

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Region	Population in a functional urban area (million inhabitants)	Climate finance from EIB projects (euros per inhabitant)
Cataluña	6.10	97.9
Andalucía	5.38	128.9
Düsseldorf	5.12	0.2
Berlin	5.11	250.2
Rhône-Alpes	4.79	191.2
Lazio	4.49	160.6
Mazowieckie	4.07	181.7
Provence-Alpes-Côte d'Azur	3.96	69.9
Campania	3.87	170.2
Köln	3.84	220.9
Attiki	3.83	175.5
Oberbayern	3.69	312.3
Darmstadt	3.62	15.0
Zuid-Holland	3.59	71.1
Hamburg	3.49	0.0
Slaskie	3.48	216.0
Région de Bruxelles-Capitale	3.40	1,082.4
Noord-Holland	3.26	11.2
Comunitat Valenciana	3.20	66.5
Stuttgart	3.10	234.7
Nord-Pas-de-Calais	3.10	280.4
Área Metropolitana de Lisboa	3.05	61.4

Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b, 2025d, 2025e and 2025f).

Our second research question explored if regions most vulnerable to the green transition would attract more climate finance per inhabitant from the EIB. The correlation between EIB climate finance and regional GTVI is shown in Figure 8. The results show a negative correlation between both variables. Contrary to EU and EIB policy discourse, then, this suggest regions most vulnerable to the transition tend to obtain less—not more—climate finance from EIB projects than other, less vulnerable, regions. On average, for each additional unit of GTVI, a region attracts -20.5% climate finance from the EIB.

Figure 9 shows the average amount of EIB climate finance obtained by EU regions, classified into quartiles based on their GTVI. Although regions in the fourth quartile (those deemed most vulnerable) tend to obtain, on average, less climate finance than other regions, these differences are not statistically significant at the 95% confidence interval.

Indeed, there is a large heterogeneity in the amount of EIB climate finance obtained from both the regions identified as the most and least vulnerable to the transition. Among those most vulnerable to the transition (55 regions in the fourth quartile), seven attracted over 200 euros per inhabitant: in Greece, Notio Aigaio and Dytiki Makedonia; in Spain, Extremadura and Castilla y León; in Poland, Slaskie; Cyprus; and, in Italy, Sardegna. In contrast, 34 out of these 55 most vulnerable regions obtained either no or very low amounts (less than 20 euros per inhabitant). These mostly included regions across South and East Europe: in Greece (Peloponnisos, Ionia

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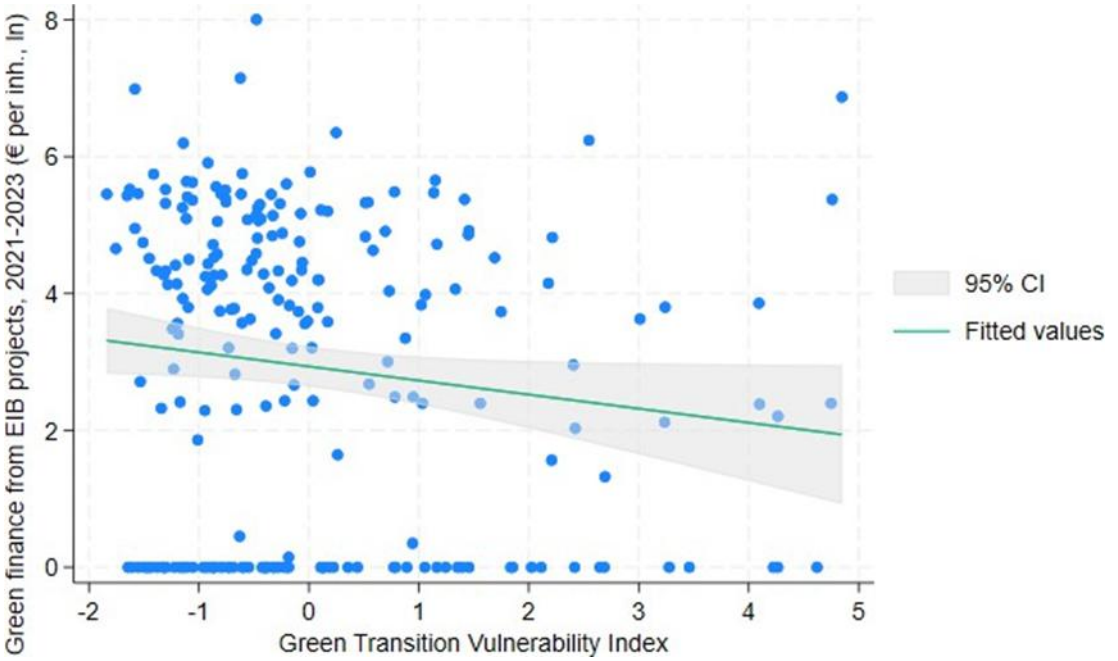
Nisia, Thessalia, Ipeiros, Dytiki Ellada, Sterea Ellada, Kentriki Makedonia and Voreio Aigaio, in order from the highest to the lowest GTVI); in Poland (Podlaskie, Lubelskie, Swietokrzyskie, Warminsko-Mazurskie and Kujawsko-Pomorskie); in Bulgaria (Yugoiztochen, Severen tsentralen, Severozapaden and Yuzhen tsentralen); in Romania (Sud-Vest Oltenia, Nord-Est, Sud – Muntenia and Vest); in Croatia (Jadranska Hrvatska, Panonska Hrvatska and Grad Zagreb); in Portugal (Alentejo, Algarve and Centro); and in Italy (Basilicata and Calabria).

Among the regions considered least vulnerable to the transition (56 regions in the first quartile), thirteen obtained over 200 euros per inhabitant of EIB climate finance, including, in Germany (Berlin, Stuttgart, Oberbayern, Oberfranken and Oberpfalz); in France (Île de France, Nord-Pas-de-Calais, and Alsace); in Belgium (Région de Bruxelles-Capitale and Région Wallone) and in Sweden (Stockholm), Italy (Liguria) and Finland (Pohjois-ja Itä-Suomi). Similarly, some 24 of the least vulnerable regions attracted less than 20 euros per inhabitant (including those that did not attract any), including 13 regions in Germany, 3 in Slovakia and 2 in the Netherlands, and one region in Czech Republic, Sweden, Hungary, Finland, Austria and Spain.

Figure 8. Correlation between EIB climate finance and the Green Transition Vulnerability Index



Source: Authors' elaboration based on EIB (2025), Eurostat (2025b) and Rodríguez-Pose and Bartalucci (2024).

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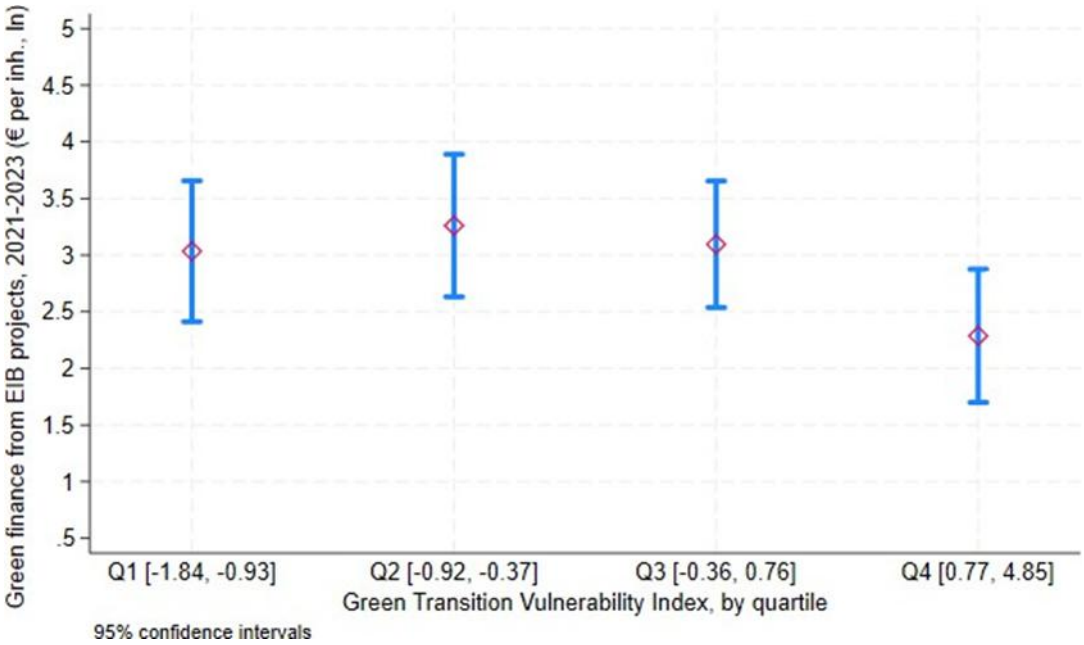
Figure 9. Climate finance from EIB projects by quartiles of Green Transition Vulnerability Index



Source: Authors' elaboration based on EIB (2025), Eurostat (2025b) and Rodríguez-Pose and Bartalucci (2024).

In addition, we conduct a similar descriptive analysis of the correlation between EIB climate finance obtained by EU regions and the other two variables we later include as control variables in the econometric analysis: the EQI and GDP per capita.

The correlation between climate finance obtained from the EIB and EQI across EU regions is shown in Figure 10. This shows a weak, positive, correlation between both variables. In addition, Figure 11 illustrates the average amount of EIB climate finance obtained by EU regions grouped by EQI quartiles. Interestingly, regions with the highest EQI (those in the fourth quartile), as well as regions with the lowest EQI (those in the first quartile) obtained, on average, less climate finance than those in the second and third quartiles. However, only the difference between the third and the first quartiles is statistically significant at the 95% confidence interval. Regions with the highest EQI, such as Övre Norrland (Sweden) and Groningen (the Netherlands) received substantial EIB climate finance, while others, such as Åland (Finland), Nordjylland (Denmark), Småland med öarna (Sweden) and Gelderland (the Netherlands), received very low levels, or no climate finance. Similarly, among the regions with the lowest EQI there are some with remarkable amounts of climate finance (such as Notio Aigaio in Greece and Sicilia in Italy) alongside regions with very little, or none (such as Dytiki Ellada and Ionia Nisia in Greece, Észak-Magyarország and Budapest in Hungary and Molise in Italy).

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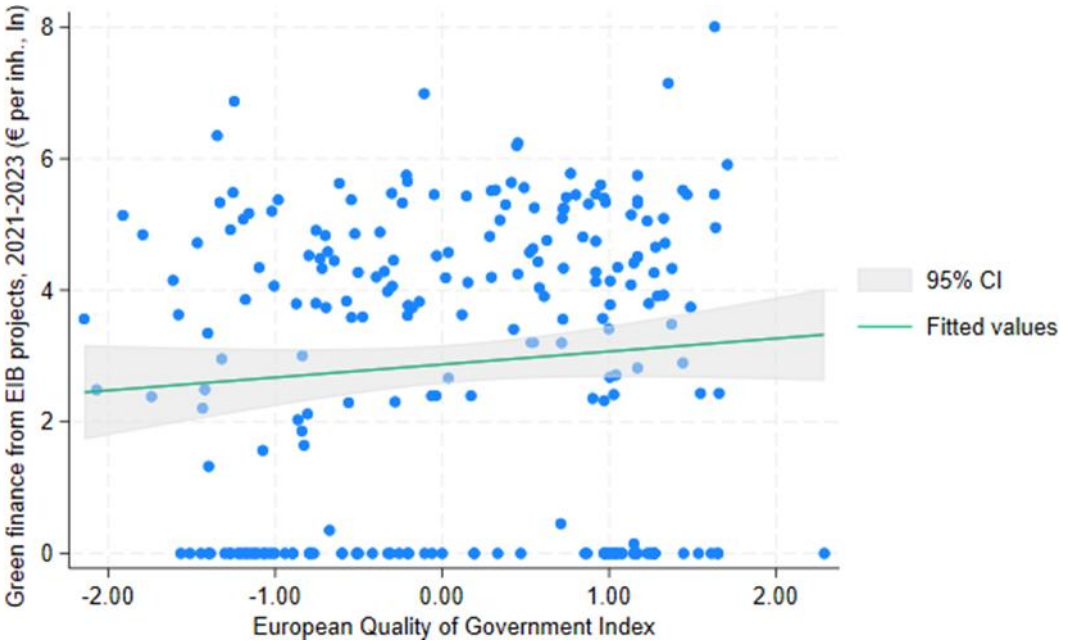
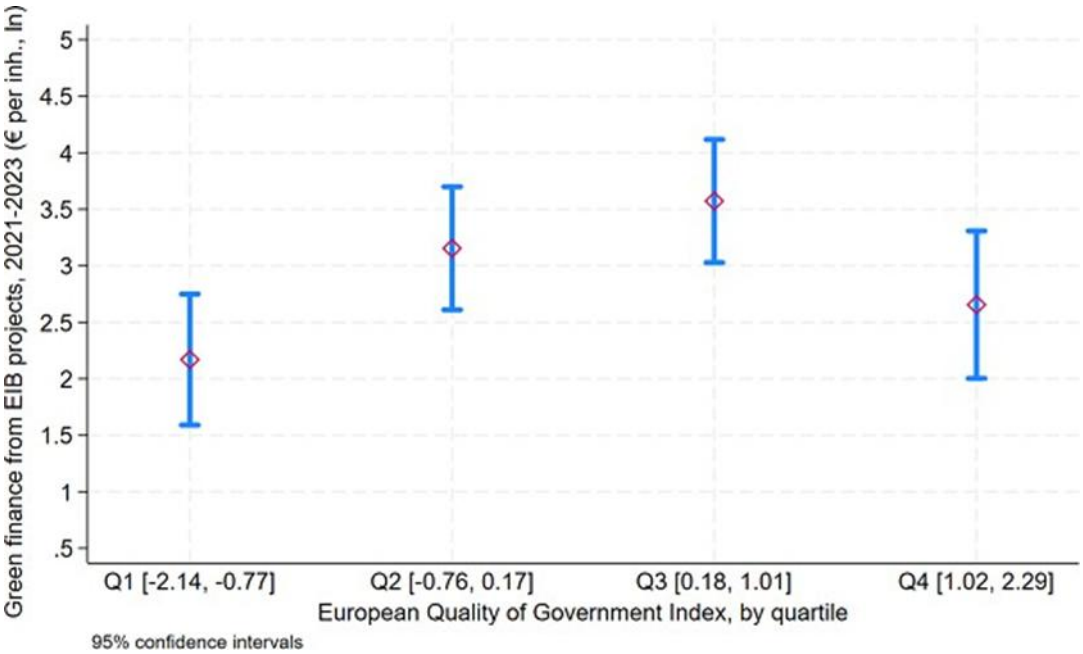
Figure 10. Correlation between EIB climate finance and European Quality of Government Index



Source: Authors' elaboration based on EIB (2025), Eurostat (2025b) and Charron et al. (2024).

Figure 11. EIB climate finance by quartiles of European Quality of Government Index



Source: Authors' elaboration based on EIB (2025), Eurostat (2025b) and Charron et al. (2024).

Next, the correlation between EIB climate finance and the GDP per capita of EU regions, also included as a control variable in the econometric analysis, is presented in Figure 12. This shows a positive correlation between both variables, indicating that the wealthiest EU regions tend to obtain more EIB climate finance than the poorest regions. Additionally, Figure 13 shows the average amounts of EIB climate finance attracted by EU regions grouped by GDP per capita quartiles. The poorest regions obtained, on average, less EIB climate finance than those in the

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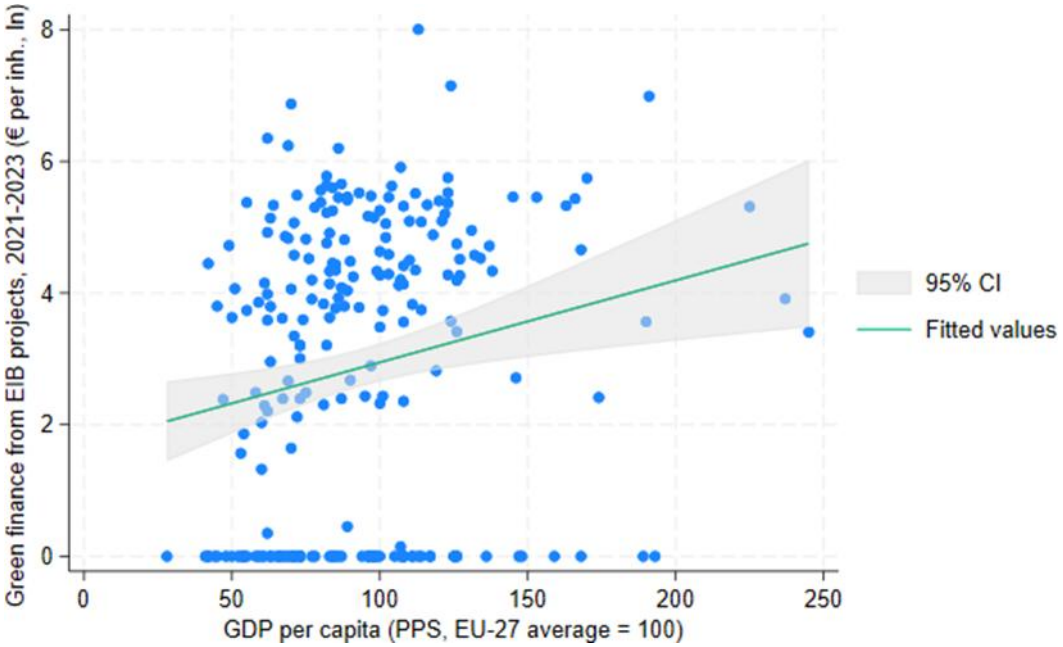
other quartiles, while the difference between them and those in the fourth quartile (the wealthiest) is statistically significant at the 95% confidence interval.

Among the 62 regions in the first quartile (the poorest regions), only five (all of which are in Southern Europe) obtained over 200 euros per inhabitant: Greece (Dytiki Makedonia and Notio Aigaio); Italy (Sicilia and Puglia); and Spain (Extremadura). The vast majority (40) of the poorest regions received between 0 and 20 euros per inhabitant. These regions included several in Eastern European (five in Hungary, five in Poland, four each in Bulgaria and Romania, three in Slovakia and one in Croatia and Czech Republic) as well as regions in Southern European countries (eight in Greece, two each in Spain and Portugal, and one in Italy), plus four French outermost regions.

Conversely, among the 58 regions in the fourth quartile (the richest regions), some 15 attracted more than 200 euros per inhabitant, and only 20 obtained less than 20 euros per inhabitant. The wealthiest regions obtained over 200 euros per inhabitant included, in Germany, Oberbayern, Stuttgart, Oberpfalz, Berlin and Köln; in Spain, Comunidad de Madrid and País Vasco; in Sweden, Stockholm and Övre Norrland; and one region each in several other countries (Southern Ireland, Région de Bruxelles-Capitale, Île de France, Provincia Autonoma di Bolzano, Groningen and Zahodna Slovenija). Those attracting less than 20 euros per inhabitant include seven regions in Germany, three in the Netherlands, two in Austria, and individual regions in various other countries.

Figure 12. Correlation between EIB climate finance and Gross Domestic Product per capita



Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b and 2025g).

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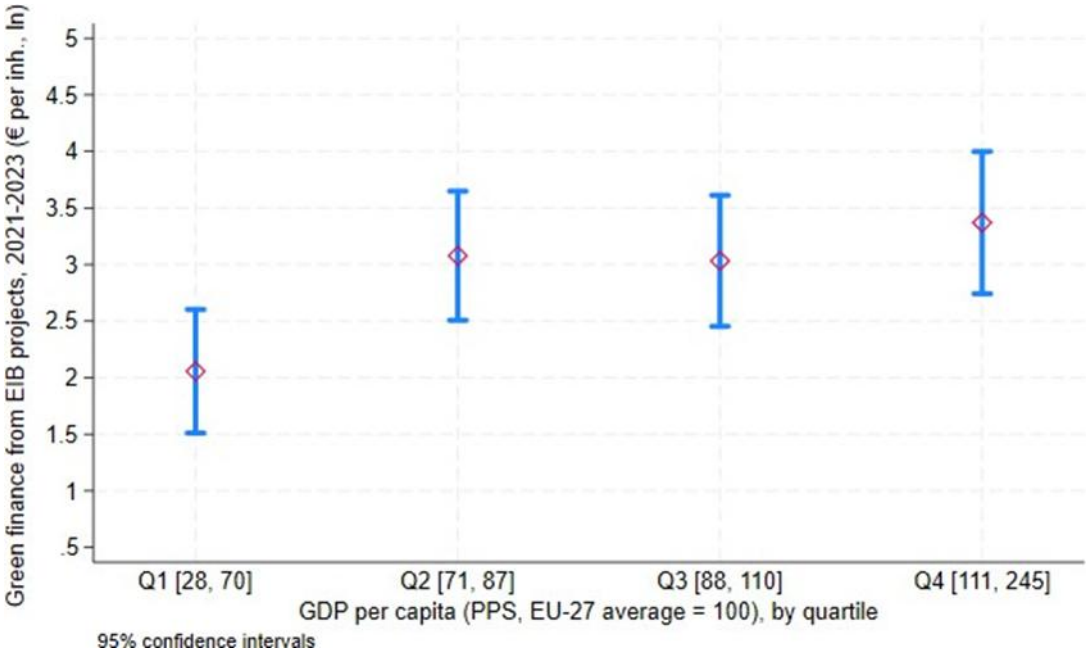
Figure 13. EIB climate finance by quartiles of Gross Domestic Product per capita



Source: Authors' elaboration based on EIB (2025) and Eurostat (2025b and 2025g).

The econometric analysis facilitates identifying which independent variables, holding all else constant, statistically explain the amount of EIB climate finance obtained by regions. This allows for the simultaneous testing of research question 1 (regarding the relationship between climate finance from EIB projects and populations living in a functional urban area) and research question 2 (regarding the relationship between EIB climate finance and vulnerability to the green transition), whilst also controlling for quality of institutions and GDP per capita of the regions. The results of this analysis are described in Table 9.

The results demonstrate, firstly, that the size of the population living in a functional urban area is a key factor that explains the volume of climate finance regions obtain from the EIB. EU regions with the largest functional urban areas (fourth quartile: those with more than 1.5 million inhabitants) received +221.5 percent more EIB climate finance than those with the smallest amount of population in functional urban areas (first quartile). This effect is highly statistically significant. In contrast, the effects for regions in both the second quartile and third quartile are not statistically significant.

Second, GTVI is non-significant in the econometric estimation, for any of the quartiles. This result confirms observations from the descriptive analysis, which showed that differences across quartiles based on GTVI in climate finance obtained by EU regions were not significant. On this basis, we find that those regions most vulnerable to the transition do not attract greater amounts of climate finance per inhabitant from the EIB.

Third, regarding EQI, regions in the third quartile (versus those in the first quartile), are associated with a greater EIB climate finance (+94.7%). This is a non-linear effect, as it is non-significant for the regions in both the second and the fourth quartile. This suggests that a medium-high level of quality of government is, when compared with an inferior level, associated with obtaining greater amounts of climate finance.

Finally, the effects of GDP per capita are non-significant in the econometric estimation for any of the quartiles. In the descriptive analysis, we observed that the poorest regions tended to obtain lower amounts of EIB climate finance than the richest. With the econometric analysis, holding all other independent variables constant, we find that the poorest (richest) regions obtain less (more)

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EIB climate finance not because they are the poorest (richest), but because of other independent variables—in particular, because these regions have, on average, smaller (larger) functional urban areas. The size of urban areas within regions is thus not only the main reason why EU regions obtain greater climate finance, but also, the indirect reason that richer EU regions obtain more climate finance than poorer ones.

Table 9. Econometric model predicting climate finance from EIB projects (2021-2023) in euros per inhabitant (in logarithms) in EU regions.

Variable	**Estimate**	**SE**	**P > |t|**
(Intercept)	0.965	0.668	0.150
Population in a functional urban area			
Q1 [0, 0.34]			
Q2 [0.34, 0.72]	0.482	0.413	0.245
Q3 [0.73, 1.50]	0.318	0.418	0.447
Q4 [1.51, 13.50]	2.215***	0.465	0.000
Green Transition Vulnerability Index (GTVI)			
Q1 [-1.84, -0.93]			
Q2 [-0.92, -0.37]	0.559	0.421	0.186
Q3 [-0.36, 0.76]	0.418	0.469	0.374
Q4 [0.77, 4.85]	0.627	0.572	0.275
European Quality of Government Index (EQI)			
Q1 [-2.14, -0.77]			
Q2 [-0.76, 0.17]	0.664	0.459	0.149
Q3 [0.18, 1.01]	0.947*	0.517	0.068
Q4 (1.02, 2.29]	0.465	0.567	0.413
Gross Domestic Product (GDP) per capita			
Q1 [28, 70]			
Q2 [71, 87]	0.506	0.497	0.310

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Variable	Estimate	SE	P > |t|
Q3 [88, 110]	0.394	0.556	0.479
Q4 [111, 245]	0.220	0.565	0.697
N			221
F			7.08
Prob > F			0.000

*** Statistical significance at 99%; ** statistical significance at 95%; * statistical significance at 90%.
Source: Authors' elaboration based on Charron et al. (2024), EIB (2025), Eurostat (2025b, 2025d, 2025e, 2025f and 2025g) and Rodríguez-Pose and Bartalucci (2024).

Main results

The main result found in this case study is that EU regions with the largest urban areas (largest metropolitan areas) attract more climate finance per inhabitant from the EIB than their counterparts. This is found in the descriptive analysis and later confirmed in the econometric analysis. Concretely, the econometric analysis estimates that regions with more than 1.5 million inhabitants living in a functional urban area received +221.5 percent more climate finance from the EIB than those regions with the smallest amount of population living in a functional urban area (up to 340,000 thousand inhabitants).

A related result is that the poorest EU regions tend to obtain lower amounts of EIB climate finance than the richest. In our analysis, we find that this is due to the fact that the poorest (richest) regions have, on average, smaller (larger) functional urban areas. The size of urban areas within regions is thus not only the main reason why EU regions obtain greater climate finance, but also, the indirect reason that richer EU regions obtain more climate finance than poorer ones.

In contrast, we do not find that those EU regions most vulnerable to the transition attract greater amounts of climate finance per inhabitant from the EIB. Differences across quartiles on GTVI in climate finance from the EIB are not statistically significant, neither in the descriptive analysis nor in the econometric analysis.

Discussion and conclusions

Climate change is humankind's major existential threat and evidence is clear that the crisis was caused by human action. Though climate scientists published evidence on this from the 1950s onwards, it is in the more recent period that some politicians have started to implement climate policies to mitigate or adapt to climate change. In spite of the devastating consequences of rising temperatures are predicted to bring negative consequences for all humanity independent of where they live—it is also increasingly recognised that climate risk is location-specific. Locations may face greater risk due to inherent characteristics, such as geography or prior industrial structures, or because climate policies such as decarbonization will disproportionately impact them (Rodríguez-Pose & Bartalucci, 2024; Zahnow et al., 2025).

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Climate finance is at the heart of climate policies, facilitating investment from public, private and non-for-profit organizations in projects promoting environmental sustainability and climate action (UNEP, 2025b). Trillions of euros are required to reach climate neutrality (EIB, 2024). However, because climate risk is unevenly spread across locations, the distribution of climate finance by location takes on a heightened political importance.

A central concern around climate finance distribution is the extent to which it is performed in a way that is "just". At the global level, this concern predominantly focuses on the idea that the "Global North" is morally responsible for climate change, whilst the Global South can ill-afford to finance the required transition, hence these costs should be paid for proportional to damage, by the Global North (O'Brien and Leichenko, 2003; Dafermos, 2025). Within the Global North, a major concern is how to balance climate finance from the regional lens. Cities and their urban areas have built themselves up based on high-polluting models and are largely responsible for climate change. At the same time, cities and urban areas have greater capacity to manage policies—including climate policies—and are better positioned to attract climate finance than other, less urbanized regions, including those dependent upon brown energy, rural or economically stagnant. There emerges, therefore, what Rodríguez-Pose & Bartalucci (2024: 349) have identified as a "paradox": cities and urban areas more successfully attract climate finance that helps facilitate their positive transformation—whilst other regions that contributed less to the climate crisis may be under-served (OECD, 2025). Policies and their finance implemented to ameliorate the climate crisis—unless carefully designed—could help create potential "winners" and "losers" of climate policy. We argue that this is more than a paradox—it is a concern for climate justice. Should climate finance follow this "paradox", it could exacerbate pre-existing inequalities between locations and limit claims of international policy objectives that the transition is "just".

The just transition concept originated during the 1970s from the alliance between environmental justice movements and labour, with its demands for fair and inclusive labour practices as an outcome of the green transition. It has evolved into a global, multi-sectoral commitment promoted by the United Nations (UN), involving considerations of procedural, distributional, recognitional and restorative justice. The end game driving this just transition is to ensure that "no-one" or "no place" is left behind (UN, 2025). In addition to being driven by concerns of justice, there are pragmatic motivations behind the just transition: when transition policies are perceived as being unfair on the ground, communities can reject them, and so-called "green discontent" (Rodríguez-Pose & Bartalucci, 2024) can emerge—potentially leading to more support of "climate denier" positions associated with populism and the far right.

The European Union (EU) has positioned itself at the forefront of global public action on climate action, its bold European Green Deal (EGD) holding the ambition of making the EU the world's first, major, climate-neutral bloc by 2050. Its multi-dimensional and complex EGD Investment Plan (EGDIP) to finance this promises to mobilize at least €1 trillion over a decade to promote a climate-friendly, regionally and socially inclusive, resource-efficient and competitive transition (EC, 2025). The EU's bank, the European Investment Bank (EIB), has been designated to implement the EDGIP from 2020 (EC, 2020; Kavvadia, 2021). At the core of the EDGIP is the "Just Transition Mechanism" (EC, 2025b) a set of tools, approaches and funds to ensure the social and economic effects of the transition are just, and that "no-one is left behind: no people no places" (EIB, 2020: 29). The EU's commitment to a just transition, where "no people, no places are left behind", is central to its climate policy. The EIB, re-launched as the EU's climate bank, plays a major role in financing this transition. Our findings, however, suggest that the distribution of EIB climate finance across regions reflect the challenges of ensuring the transition is really just.

Given the centrality of the role played by the EU and the EIB in climate finance, and the ongoing concerns around the challenges of "just" finance, this case study has investigated the extent to

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which the policy ambitions of the "just transition" are reflected in the actual distribution of climate finance in the context of the EGDIP.

In this case study, we identified the locations of all EIB climate finance between 2021 and 2023 given the data available in the EIB project database. Based on this, we tested the extent to which EIB climate finance was obtained by the larger urban areas, and whether regions most vulnerable to the transition obtained greater EIB climate finance. Our results confirmed important concerns in the literature that signal challenges around a just distribution of climate finance: cities and their urban areas are better placed to implement transition policies and obtain climate finance, whilst other, lesser urbanised areas may struggle (Rodríguez-Pose & Bartalucci, 2024; EIB, 2025; OECD, 2025). These results suggest that transition policies are conceived and developed in ways which make them easier to implement in urban areas. Regions with larger populations living in cities and urban areas obtained significantly more climate finance per inhabitant. In particular, we found that regions with over 1.5 million inhabitants received substantially more climate finance than other regions. This pattern can partly be seen in the large-scale infrastructure flagship projects financed by the EIB in major urban areas. In Paris, for example, the "Grand Paris Express – Ligne 15 Sud" received €1 billion for a 33 km automated metro line with 16 stations; Cologne (Köln)'s S-Bahn network was awarded €761 million to renew its rolling stock, and Madrid was allocated €518 million for the "Madrid Railway Node Capacity Expansion", to transform Atocha and Chamartín train stations into a unified high-capacity hub. We also found that regions characterized by greater vulnerability to the transition—often rural, development-trapped, or brown energy-dependent—were correlated with less likelihood of obtaining climate finance. Our econometric analysis did not find that a greater GTVI was correlated to a region's obtaining more climate finance.

Our analysis also considered institutional quality (EQI) and GDP per capita as control variables. EQI shows some significance in the third quartile, suggesting that regions with moderately strong institutions may be better positioned to attract climate finance, as predicted in the literature (OECD, 2025; EIB 2025). However, this effect is not consistent across the distribution. One possible interpretation is that regions in the third quartile rely more on support from EU institutions such as the EIB, whilst regions in the fourth quartile may have access to alternative, national funding sources, being less reliant on the EIB, such as the case of Germany with its KfW. Similarly, GDP per capita correlates with climate finance, but its effect is not statistically significant once differences across regions in population living in functional urban areas are accounted for. In short, population living in larger urban areas is the dominant factor explaining a region's obtaining climate finance.

This approach applies a regional lens to inform our understanding of the impact of the transition and climate finance. We find that, despite the political rhetoric around the importance of a just transition, a pattern is emerging whereby inhabitants of cities and urban areas are more likely to obtain climate finance than those living in other, less urbanized, regions. Because cities are largely responsible for climate change and are better positioned to manage climate policies, the evidence that they are also proving better positioned to obtain climate finance—though bringing unquestionable benefits to cities—undermines claims of the "just transition", potentially leaving behind less urbanized, rural and lagging-behind places. It may happen also, as shown in other case studies described in this document, that disadvantaged regions are not left behind in the green transition, but adversely incorporated (e.g., cases on lithium extraction in Portugal and Serbia). Climate action based on using capital and technology intensive solutions to transform highly polluting regions and sectors face the risk, as pointed out in this report, pose a serious risk for expanding or even sustaining the green transition.

Our study faced limitations, most importantly, on compiling the most comprehensive dataset of EIB climate projects possible, not all finance could be regionalized, since the EIB itself states it does not categorise its projects regionally. Some projects are national in scope, whilst others lack

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sufficient location data (such as Multiple Beneficiary Intermediated Loans, most of which are addressed to SMEs). Moreover, our analysis covers only three years—an important period of institutional change, but insufficient to capture long-term trends. Future research may try to address these limitations, enlarging the dataset by incorporating projects from more recent years once they are provided by the EIB. In addition, specific analyses can be carried out for differentiated type of projects.

Recommendations

This work has important policy recommendations. The EIB was tasked with supporting the just transition as a core policy of the EGD, whereby people and places would not be left behind. Since the EIB does not currently publish data on the regional distribution of its climate finance, greater availability of data on this for researchers and policymakers would facilitate understanding the dynamics of patterns of EIB climate finance distribution. From the literature, we know cities are associated with greater responsibility for climate change but obtain more climate projects and finance, this is not deemed just, requiring redress (OECD, 2025; EIB, 2025). However, from the data we have been able to construct, which covers over half of EIB climate finance distributed between 2021 and 2023, we found that larger cities and urban areas obtain significantly greater climate finance per inhabitant than their less urbanised counterparts. Whilst this finding may be a temporary one—perhaps cities have been first-movers with smaller regions to follow— it is also of note that, from 2023, the policy environment around the just transition in the EU has been potentially weakened by the EC's Omnibus 1 Package (EC, 2025c), published on the heels of the Draghi report, whilst the implementation of the EU's flagship €26.7 billion "Just Transition Fund" to date has been criticised as being onerous, bureaucratic and not reaching projects to retrain workers negatively impacted by the transition (Yeung, 2025). At the same time, the EIB has expanded the eligibility criteria for lending for defence and security (EIB, 2025c). In this evolving geopolitical scenario, it remains to be seen whether the next few years of climate finance will improve their reach into Europe's smaller, less urbanized regions—or, whether the just transition rhetoric will be side-lined for newer concerns.

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1.10 Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South

Overview

In the effort to safeguard the integrity of the Earth's biosphere, Europe has introduced an ambitious set of measures to reduce its contribution to climate change. These are largely bundled under the European Green Deal (EGD), which commits the EU to a 55 % reduction in greenhouse gas emissions by 2030 and to achieving climate neutrality by 2050 (European Commission, 2019). The Green Deal aspires not only to ecological sustainability but also to economic viability and social fairness. To support this Just Transition, the EU has allocated around €55 billion to mitigate socio-economic impacts in the regions most affected by decarbonisation. Yet, evidence increasingly suggests that the transition may reproduce or even intensify social inequalities, with vulnerable groups bearing disproportionate costs (Baran et al., 2020; Chateau et al., 2018; Wang et al., 2016).

Across the globe, the number of climate-related laws has multiplied, from 72 in 1997 to over 5000 in 2017 (Nachmany & Setzer, 2018). Within Europe, this expansion has taken the form of market-based instruments such as carbon taxes, the EU Emissions Trading System, and fuel excise duties, alongside regulatory measures and renewable-energy incentives (Nachtigall et al., 2022). These instruments aim to accelerate the transition to a low-carbon economy but can also generate unintended distributional effects. Empirical evidence shows that environmental taxation and rising energy prices may disproportionately affect low-income households and regions heavily dependent on fossils (Haug 2018). This makes it crucial to examine whether the social dimension of the Green Deal and its objective of fairness are being achieved.

This case study therefore investigates both the social and environmental consequences of environmental policy stringency in the European Union. The first part analyses how stricter environmental policies influence income inequality within European countries, capturing whether the transition burdens lower-income groups more heavily and how welfare systems mitigate these effects. The second part extends this perspective beyond Europe, exploring whether the same policies contribute to carbon leakage, which refers to the offshoring of emissions through trade with less regulated economies in the Global South (The terms emission offshoring and carbon leakage are used interchangeably in this report). Together, these two dimensions reveal the paradox of Europe's green transition: policies designed to ensure fairness and sustainability at home may, under certain conditions, shift environmental and economic pressures elsewhere.

This dual focus aligns closely with the GreenPaths project's broader aim of understanding how green transition policies shape both environmental sustainability and social wellbeing. By linking environmental policies with both, domestic inequality outcomes and international emission flows, the study highlights how the social and environmental dimensions of Europe's transition are deeply interconnected. Stricter climate policies can advance decarbonisation but also redistribute costs across income groups and national borders. The findings therefore emphasise the importance of policy coherence, ensuring that environmental ambition is matched by social protection at home and by fair, cooperative mechanisms in global governance. In doing so, the case contributes to a wider understanding of how the green transition can deliver not only on climate objectives, but also on its promise of a just transition, in Europe and globally.

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Research questions

The central research questions of this study are whether stricter environmental policies in Europe simultaneously a) exacerbate economic inequality at home and b) shift emissions abroad. Using the OECD's Climate Actions and Policies Measurement Framework (CAPMF) the study assesses the following questions:

i. Is stringent environmental legislation associated with greater income inequality within Europe?
ii. Is stringent environmental legislation associated with higher imported emissions from the Global South?

Together, the two dimensions highlight the paradox of Europe's Just Transition: while intended to be fair and inclusive, such policies risk placing disproportionate burdens on economically vulnerable groups in Europe and climate protection efforts abroad.

Methods

This case study applies panel data econometrics for the two analytical dimensions. The key explaining variable of these analyses, the Environmental Policy Stringency Index (EPSI) taken from OECD's CAPMF, is an index within the range from 0–10 which covers 130 climate mitigation policy variables, including market and non-market-based instruments. It is the only validated database providing consistent, harmonised, long-term cross-country data on policy stringency (Nachtigall et al., 2022). The database provides indices for sectoral, cross-sectoral, and international policies, which are then combined to create the aggregate EPSI. Since this paper is concerned with the impact of domestic (within Europe) environmental policy adoption and stringency, the EPSI's subindex that captures international policies is excluded from this analysis. Out of the total 130 policies in the framework, aggregated into 56 policies of which 36 are sectoral policies and 12 are cross-sectoral policies (Nachtigall et al., 2022). Using this, a weighted combined average was calculated to create the respective domestic EPSI of the countries in both analyses.

Domestic analysis

The objective of the first analysis is to assess the effect of environmental policy stringency (EPSI) on income inequality (Gini). The empirical model is given by the following equation:

$$Gini_{it} = \alpha + \beta_1 \, ln_EPSI_{it} + \beta_2 \, ln_GDP_{it} + \beta_3 \, ln_unemp_{it} + \beta_4 \, ln_SocX_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where *ln GDP* represents the natural log of GDP p.c., *ln unemp* is the log of unemployment percentage, and *ln SocX* is the log of public social expenditure, which is percentage of GDP. γ_i and λ_t are country- and time-fixed effects, respectively. The natural logarithm was taken so that the coefficients in the estimation results can be discussed in terms of elasticities.

The econometric estimation relies on a balanced panel data set, from 1990 to 2022. It focuses on a core group of twenty EU and European Free Trade Association (EFTA) economies (EU/EFTA membership is defined according to current status. For countries that became independent or joined the EU/EFTA after 1990 (e.g., Czechia, Slovakia, Slovenia, Hungary), harmonised historical national accounts allow us to construct a balanced panel beginning in 1990) with long-run, high-quality data on income distribution and social expenditure. This includes both Western and early Central-Eastern member states such as Czech Republic, Hungary, Poland, Slovakia, and Slovenia (Complete list of countries: Austria, Belgium, Czechia, Denmark, Finland, France,

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Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom). This sampler represents countries with the most complete series in the inequality data, relatively similar welfare structures, and more stable and institutionally mature welfare systems (Korzeniowska, 2021; Gubello and Dunne, 2025).

The dependent variable, income inequality, is measured by the Gini coefficient and was sourced from the World Inequality Database (WID) database. This analysis uniquely offers a comprehensive picture of the distributional impact of environmental policies. This is done using three measures of income inequality as dependent variables: the pre-tax national income Gini coefficient, which includes income flows before taxes and transfers but after pensions; the post-tax disposable income Gini coefficient which measures income inequality after taxes and direct government cash transfers; and the post-tax national income Gini coefficient accounting for taxes, direct cash transfers, and in-kind transfers. This analysis shows not only the effect of environmental policies' stringency on income inequality, but also how that influence is mitigated by redistributive mechanisms.

Summary statistics for all variables explaining the empirical analysis are provided in Table 10. The *pre-tax* and *post-tax Gini* have 660 observations, while the disposable income Gini has 613 observations. For the latter, the missing observations are from France.

Table 10. Summary statistics

Variable	Unit	Obs.	Mean	Std. Dev.	Min	Max
Pre-tax Gini	Percentage	660	0.432	0.047	0.307	0.536
Post-tax Gini	Percentage	660	0.289	0.0596	0.124	0.443
Disp. Gini	Percentage	613	0.366	0.067	0.127	0.554
EPSI	Index (0-10)	660	1.931	1.528	0	5.675
GPDp.c.	Annual %	656	1.765	3.365	-14.639	23.443
Unemp	% of total labor force	640	8.413	4.367	2.015	27.686
SocX	% of GPD	640	22.866	4.501	5.681	34.876

The WID Manual by Blanchet et al. (2024) provides definitions for each of the inequality measures, as outlined in Table 11. Accounting for endogeneity, cointegration, and slope heterogeneity, this analysis employs the Augmented Mean Group (AMG) estimator for panel timeseries introduced by Eberhardt and Teal (2010).

Table 11. Definitions of the three measures of the Gini coefficient

Measure	Definition	Calculation	Interpretation
Pre-tax National Income Inequality	Measures income inequality before ac- counting for taxes and government transfers.	Gini coefficient of pre-tax national income (includes labour, capital, and pension income but excludes social insurance benefits).	Indicates baseline in equality before any re- distribution. Higher values imply greater pre-tax income dispar- ities

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Measure	Definition	Calculation	Interpretation
Disposable Income Inequality	Measures income in- equality after taxes and direct government cash transfers.	Gini coefficient of post- tax disposable income (pre-tax national in- come minus all taxes plus social assistance benefits in cash).	Shows the impact of direct taxation and social transfers on in- come inequality. A lower value than Pre- tax Gini indicates re- distribution effective- ness.
Post-tax National Income Inequality	Measures income inequality after taxes, direct cash transfers, and in- kind transfers (e.g., public services like health and educa- tion).	Gini coefficient of post-tax national income (post-tax disposable income plus in-kind transfers such as education and healthcare.	Provides the most comprehensive measure of income distribution, reflecting both monetary and in- kind government redistribution efforts.

Information based on the WID Manual (Blanchet et al., 2024).

The conceptual framework illustrated in Table 12 identifies three key economic channels through which the effects can materialize: *1)* the Income Side, which captures labour market disruptions and wage dynamics; *2)* the Expenditure Side, which reflects rising costs of energy and essential goods, and can disproportionately affect low-income households due to their consumption patterns; and *3)* and the Government Side, which encompasses fiscal policies, such as carbon tax and revenue recycling, that can either mitigate or amplify inequality. The framework in Table 12 shows the complexity of the relationship between environmental policy stringency and income inequality, demonstrating that the nature of the impact of environmental policy stringency depends on three key factors: (1) the policy tool, (2) the sector addressed, and (3) the design of the policy. These factors, impacting whether the environmental policies mitigate or exacerbate income disparities, highlight the need for careful policy design to ensure equitable outcomes. These policy-specific factors, however, also interact with broader macroeconomic forces that shape the distribution of income. Hence, the control variables GDP per capita, unemployment, and social public expenditure were included in the analysis.

Table 12. Transmission channels between environmental policies and inequality.

Channel category	Transmission channel	Sources	Expected effect of environmental policy stringency on inequality
Income Side	Labour market shifts from brown to green sectors	Baran et al. (2020), Chateau et al. (2018), Karagianni and Pempetzoglou (2022),	Increasing

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Channel category	Transmission channel	Sources	Expected effect of environmental policy stringency on inequality
		Pavloudakis et al. (2023), Cha (2017)	
	Reskilling	Chun (2024), Bray et al. (2022)	Decreasing
	Capital and Land Ownership Effects	Zachmann et al. (2022)	Increasing
Expenditure Side	Energy price increases	Voicu-Dorobant,u et al. (2021), Middlemiss (2022), Bagus and Pena- Ramos (2023)	Increasing
	Transport cost increases	Sterner (2012), Flues and Thomas (2015), Berry (2019), Ohlendorf et al. (2021)	Mixed results
	Higher costs of food and essential goods	Angelico (2024)	Increasing
Government Side	Revenue recycling	Frondel et al. (2015), Carattini et al. (2017), Haug et al. (2018), R¨ub (2024)	Decreasing
	Public investment in green infrastructure and social programs	Liquete et al. (2015), Pauleit et al. (2019)	Decreasing

Note that these mechanisms are often context-dependent; therefore, the table presents general trends observed in the cited studies.

International analysis

The second component of this study extends the scope to cross-border effects, assessing whether stringent European policies may shift CO_2 emissions abroad via imports from the Global South. The data for CO_2 emissions were extracted from the EORA Global Supply Chain database, which offers global coverage for 190 countries and 26 harmonized sectors from 1990 onwards (Lenzen et al., 2013) (Although Eora's automated construction introduces uncertainties at fine sectoral and bilateral levels, it remains the only publicly available MRIO providing consistent sector-wise and country-wise trade and emissions data for both European and Global South economies. Aggregated analyses at the country-sector level are considered robust for cross-regional comparisons (Lenzen et al., 2013). The Input-Output (IO) data from EORA was used to calculate the factors of production, in this case CO_2 emissions, occurring in Global South countries, embodied in exports to 27 EU + EFTA countries.

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Based on existing literature, there is some evidence of carbon leakage but that has focused on specific policy measures, such as the EU Emissions Trading System (Verde, 2020; Wang & Kuusi 2024) or Kyoto Protocol (Aichele & Felbermayr, 2015). This study, focusing on an extensive and internationally harmonised climate mitigation policy index, extends the carbon leakage analysis to 27 EU + EFTA (Complete list of importing countries: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, Bulgaria, Croatia, Estonia, Iceland, Latvia, Lithuania, Luxembourg, Malta, Romania, Switzerland) to capture the full geography of the EU's trade relations with the Global South (Complete list of exporting countries: Sub-Saharan Africa: Ghana, Senegal, Nigeria, Kenya, Tanzania, South Africa. Asia: India, Indonesia, Vietnam, Pakistan, Sri Lanka, Malaysia, Uzbekistan. Latin America: Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Venezuela, Costa Rica. Middle East and North Africa: Egypt, Morocco, Jordan). Including smaller (with lower GDP or trade volumes) member states such as Bulgaria, Croatia, Estonia, Latvia, Lithuania, Malta, and Romania ensures a complete mapping of embodied emissions in imports.

The channel of carbon leakage under investigation here is that of international trade, which is associated with the pollution haven hypothesis (Copeland/Taylor, 1994). The hypothesis argues that the implementation of an environmental regulation will impact relative prices by increasing the costs of production within the regulated country - European countries in this study. The overall effect of the regulation will be a reduction in the demand for goods produced in the regulated country, while the demands for substitutes produced in the 'non-regulated' countries will increase. Lower demand hurts the profits of firms in the regulated country, which may incentivize them to move their production to a country with laxer environmental regulations (Copeland, 2004; Thomsen, 2021). Based on this framework, the second analysis investigates whether increased stringency of environmental policies in European countries shifts emissions abroad to Global South countries with weaker economies where environmental policies are laxer (De Beule 2022.; Koźluk and Timiliotis, 2016).

The literature identifies three channels by which carbon leakage can occur. The first channel, the competitiveness channel, refers to the changes in comparative advantages of the industries in the regulated countries that are emission-intensive and face competition via trade from non-regulated countries. Carbon mitigation policies raise production costs of the energy intensive markets which can lead to loss of competition and share in the international market. This prompts industries to shift production to non-regulating countries with lax environmental policies and cheaper production costs. The second channel refers to the changes in demand for energy intensive goods in regulated countries. Since climate policies affect the relative incomes and prices of goods, this shifts the demand from the regulated to non-regulated countries. The third, energy channel, is linked to fossil-fuel price changes and energy substitution effects. It is not directly relevant to our trade analysis therefore we focus on the first two channels.

The econometric analysis was conducted using a structural gravity model to estimate the effects of EPSI on carbon leakage in international trade. The gravity model of international trade, used for estimating bilateral trade flows and policy effects, is based on Newton's law of universal gravitational force, according to which the gravitational force between two objects is directly proportional to their masses and inversely to the squared distance between them. Translated to economics, this means that trade (or trade-related outcomes) depends positively on the economic size of trading partners and negatively on bilateral trade costs. The latter are captured by multilateral resistance terms (Anderson and van Wincoop, 2003). To calculate the emission embedded in imports, the following equation was parameterised:

$$D_{imp} = S * L * Y_t$$

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Where D_{imp} is emissions embedded in imports from global south countries to Europe, S is direct emissions intensity of production in, multiplied with the Leontief matrix L that includes the input-output ratios, to get *total* number CO_2 emissions along the entire production and supply chain that were emitted or used in service of creating that unit of output. This is then multiplied with Y_t, which is the final demand matrix of the importing country and includes only the imported portion of final demand.

Based on this theoretical foundation, the model includes importer-year, exporter-year, and pair fixed effects, in line with best-practice recommendations in gravity estimations (Piermartini & Yotov, 2016). The use of a multiplicative specification with Poisson Pseudo-Maximum Likelihood (PPML) allows for the inclusion of zero flows and addresses heteroskedasticity, ensuring unbiased and efficient estimates (Piermartini & Yotov, 2016). The final estimation equation is as follows:

$$CO_{2ijst} = exp\{\beta_0 + \beta 1\ EPSI_{jt} + \alpha_{ijs}\} + \varepsilon_{ijst}$$

Where CO_{2ijst} is emissions embodied in imports from Global South exporter i to EU importer j in sector s and year t, $EPSI_{jt}$ is the stringency index of importer j in year t, α_{ijs} is the fixed effect capturing all time-invariant heterogeneity between exporter i, importer j, and sector s, and ε_{ijst} is the error term. The *exp* operator indicates the multiplicative PPML specification.

Together, these two analytical dimensions capture both the domestic distributional and the global spillover effects of environmental policy stringency. This twofold approach connects the internal equity dimension of the green transition with its external carbon footprint, thereby linking social and environmental justice perspectives within the same analytical framework.

Findings and results

Domestic analysis

Before the estimation, several diagnostic tests were performed to confirm the data properties. The Pesaran and Yamagata (2008) slope-homogeneity test rejected the null of homogeneous slopes, indicating country-specific relationships between variables. The Fisher-ADF test confirmed cross-sectional dependence, implying that shocks in one economy affect others. Unit-root and cointegration tests (Westerlund 2008; Pedroni 1999) confirmed long-run relationships, justifying the use of the AMG estimator, which accounts for both cross-sectional dependence and slope heterogeneity.

Table 13 displays the results of the AMG estimation for each of the Gini coefficients. The results suggest that *EPSI* has a positive and statistically significant effect on *pre-tax* and *post-tax Gini*. *Pre-tax Gini* increases by 0.5% associated with an increase in environmental policy stringency by 10%, and *post-tax Gini* by 0.7%. *EPSI* does not have a statistically significant impact on *disposable Gini*. The robustness checks are consistent with the main estimation in terms of signs and order of magnitude, suggesting that the results are not driven by the estimation procedure. The per capita growth rate of GDP has a statistically insignificant relationship with *pretax* and *post-tax Gini* in the AMG estimation. However, *GDP p.c.,* shows a significant relation with *disposable Gini*, increasing it by 0.08% when increasing itself by 10%. Unemployment has a positive and statistically significant relationship with the *pre-tax* and *post-tax Gini* measures. *Pre-tax Gini* increases by 0.4% when unemployment increases by 10%, while *post-tax Gini* does so by 0.5%. Social public expenditure has statistically significant and negative relationships with all three estimations in Table 13. *Pre-tax Gini* decreases by 2%, *post-tax Gini* by 4.1% and *disposable Gini* by 2% when social expenditures increase by ten percent. The coefficient plot in

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Figure 14 visualizes the regression results, showing a consistent positive association between *EPSI* and inequality, while social expenditure (*SocX*) is strongly inequality-reducing.

The use of the three Gini measures is crucial to understanding not just the impact of environmental policies on income inequality in Europe, but also how the welfare state can mitigate or worsen these effects. Thus, the positive and significant relation between EPSI and pre-tax Gini reflects the market-driven inequality effects of environmental policy stringency, where structural change and labour-market reallocation amplify pre-distributional disparities. Stringent environmental measures reshape labour markets, disproportionately affecting low-skilled workers, especially those living in regions heavily dependent on fossil fuels (Baran et al., 2020; Chateau et al., 2018). As fossil-fuel sectors phase out, displaced workers often struggle to re-enter employment, especially where reskilling programmes remain inadequate (Haug et al., 2018; Chun, 2024; Seo, 2021). Wage stagnation and sectoral decline amplify the effect, as shown by Rud et al. (2024) in the UK coal-industry collapse, where earnings fell by up to 80–90 %. Rising energy and transport prices, driven by carbon pricing and subsidy removal, further burden lower-income households, reinforcing the regressive pattern (Frondel et al., 2015; Wier et al., 2005).

Table 13. Regression results: effects of environmental policies' adoption and stringency on income inequality

Dependent Variable	**ln *Pre-tax Gini***	**ln *Disp.Gini***	**ln *Post-tax Gini***
ln *epsi*	0.054***	-0.011	0.07***
	(0.000)	(0.656)	(0.003)
ln *GDP p.c.*	-0.005	0.008***	-0.0005
	(0.206)	(0.000)	(0.916)
ln *Unemp*	0.046**	0.024	0.053**
	(0.016)	(0.535)	(0.026)
ln *SocX*	-0.187**	-0.176**	-0.415***
	(0.003)	(0.045)	(0.000)
Comm. Dynamic Pr.	0.354**	0.486**	0.187
	(0.023)	(0.020)	(0.180)
Constant	-0.381**	-0.512*	-0.120
	(0.001)	(0.054)	(0.628)
Root Mean Squared Error (sigma)	0.0295	0.0525	0.0420
Observations	510	469	510
Number of country	20	19	20

*AMG Estimation. ***p<0.01, **p<0.05, *p<0.1*

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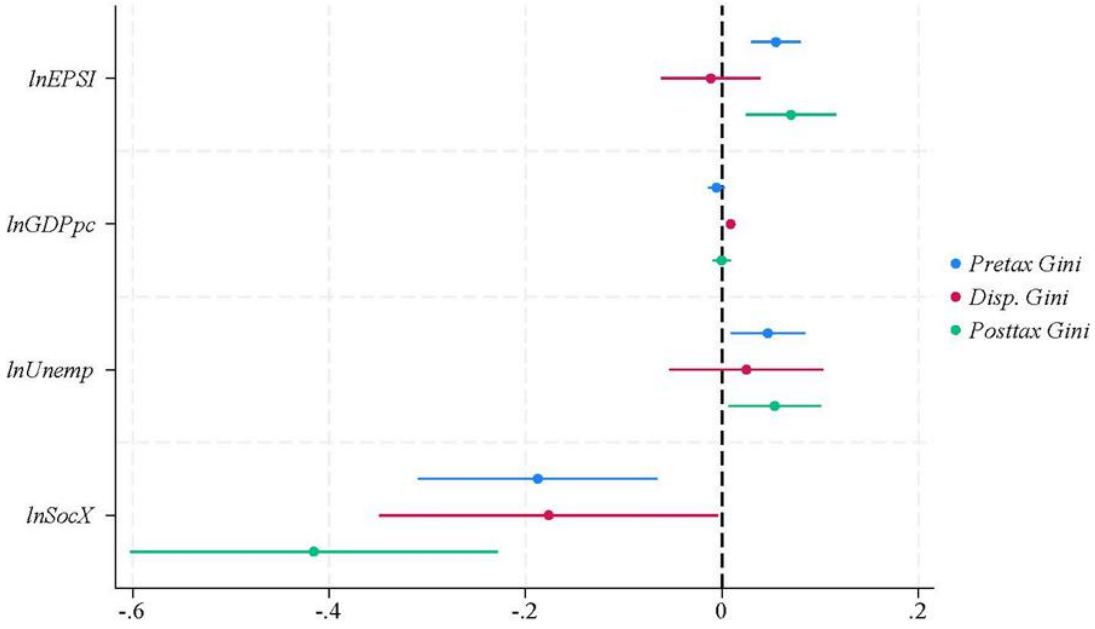
However, the results also point to an important compensatory mechanism: government intervention through social and tax policy mitigates disposable income inequality in the selected European countries in the first analysis. The insignificant relation between EPSI and the disposable Gini coefficient highlights that progressive taxation and direct cash transfers offset much of the inequality generated by environmental policies. Direct revenue recycling, through lump-sum "tax-and-dividend" payments, has proven effective in reducing the distributional consequences of environmental regulation (Burtraw et al., 2009; Frondel et al., 2015; Haug et al., 2018; Rüb 2024). Such measures compensate households, particularly those with low incomes, while preserving emission-reduction incentives. Complementary instruments like targeted hardship compensation further balance costs (Edenhofer et al., 2021).

However, the higher post-tax Gini coefficient reveals limits to redistribution via in-kind transfers such as education and healthcare (Giangregorio 2024; Palm et al., 2021). While in-kind transfers in terms of universal services such as healthcare and compulsory education do play a role in reducing inequality (Jianu, 2020; Pena-Sanchez et al., 2021), these effects may not be as strong in higher-income countries. Giangregorio (2024) finds that cash transfers generally reduce inequality more effectively than in-kind benefits, though the impact varies across welfare regimes: taxes and cash transfers have the strongest redistributive effects in Nordic countries, while in-kind benefits, particularly health and education, are most effective in Mediterranean systems. In high-income European welfare states, however, tertiary education and healthcare can become mildly regressive, as their benefits disproportionately accrue to higher-income households, highlighting the need for adaptive welfare design during green transitions. And although universal services reduce overall inequality, their redistributive power is weaker and slower to respond to rising living costs. Structural access barriers, such as rural gaps, disability, migration, restrict the reach of these services, limiting their effectiveness during rapid transitions (Palm et al., 2021).

Figure 14. AMG Estimation Coefficient Plot



Beyond policy stringency itself, labour-market dynamics and the level of social spending can impact the extent to which EPSI intensifies or mitigates income inequality. Rising unemployment increases both pre-tax and post-tax Gini values, indicating that job loss disproportionately harms low-income groups, the "outsiders" in segmented labour markets (Seo, 2021), a phenomenon

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captured succinctly by Doctorow (2022): "the last hired (women, racialized people) are the first fired, and the last to be re-hired." This interaction between labour-market shocks and environmental policy stringency underscores the importance of integrating just transition policies within climate governance frameworks. The stronger effect on post-tax Gini underscores that in-kind support cannot fully replace lost earnings, whereas unemployment benefits cushion disposable income. Lastly, social expenditure consistently reduces inequality: a 10 % increase in *SocX* lowers pre-tax Gini by 2 % and post-tax Gini by 4 %, confirming its central role in mitigating both present and future inequality.

Overall, these findings show that environmental policy stringency increases inequality before redistribution, but strong welfare institutions, through targeted cash transfers and social spending, can effectively neutralise much of this impact.

International analysis

Complementing the domestic analysis, the second analysis extends this perspective outward, exploring whether stricter EU policies contribute to emissions offshoring through trade with the Global South. The regression results are displayed in Table 14. The results of this analysis show that higher environmental policy stringency in Europe is strongly associated with higher levels of imported emissions from global south countries: If environmental policies become 10 percent more stringent, then emissions embodied in imports increase by 1.3 percent (The estimated effects were calculated in terms of the effect of a 10 percent increase in environmental policy stringency, with the resulting change in imported CO_2 emissions expressed as a proportion of their average level). The results were disaggregated to the level of different exporters in the Global South country (see Figure 15 and

Figure 16, the latter is without Venezuela to make the coefficient plot easier to understand) and suggest that emissions are imported increasingly from most Southern countries in our sample (For a small number of countries (Bangladesh, Chile, Jordan, Kenya, Malaysia, Tanzania, Venezuela, and South Africa), the emissions decrease with increase in EPSI). When the results are decomposed by sector (see Figure 17), we can see that European countries are importing emissions from most of the 26 sectors in the Global south. The finding thus suggests that European decarbonisation has been partially externalised, with mitigation achieved domestically (Eslahi, Creti, & Sanin, 2026; Ugrinov, 2025; Green, 2021; Ziemblińska et al., 2025) but offset by increased embodied emissions abroad. The aggregate coefficient should be interpreted as the net effect of EPSI on imported, embodied emissions. Since CAPMF includes both carbon and non-carbon policies, the estimated elasticity of 1.3% is not solely from carbon-pricing measures but reflects the cumulative regulatory pressure across multiple environmental policy domains, including regulations on air pollutants (NOx, SOx, PM), industrial energy and resource-efficiency standards, and planning instruments related to renewables and resource use. This explains why the aggregate relationship, while statistically significantly positive, is moderate. Increasingly stringent environmental policies can trigger substitutions and adjustments across several sectors but may not force a full-scale relocation in all sectors. The positive coefficient of the aggregate EPSI is therefore a sign of broad environmental policy leakage effect, and, along with the sectoral

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decomposition, may be understood through a multichannel framework. The following discussion offers a general interpretation of sectoral differences rather than a detailed decomposition. Given that each industry has its own regulatory composition and exposure to specific policy instruments, a deeper sector-by-sector analysis would go beyond the scope of this study.

Table 14. Regression results: effects of EPSI on emissions embedded in imports

Dependent Variable	Emissions
ln *epsi*	0.0894*** (0.000)
Constant	4.4766*** (0.000)
Observations	156,000

Differences in the estimated sectoral parameters largely reflect two underlying structural factors: variation in emission intensity and relocation or tradability constraints. These factors can shape how the leakage channels on competitiveness, domestic demand, and compliance costs can operate across sectors. The competitiveness channel links higher environmental policy stringency to production costs. More emission-intensive and energy-dependent sectors face stronger cost pressures under market-based instruments such as carbon taxes or the EU ETS (Copeland & Taylor, 2004; IEA, 2008). However, only those activities that are both carbon-intensive *and* easily tradable can effectively relocate production abroad, which limits the channel's scope.

Figure 15. Country-level coefficients for the CAPMF × Global South interaction in the PPML estimation

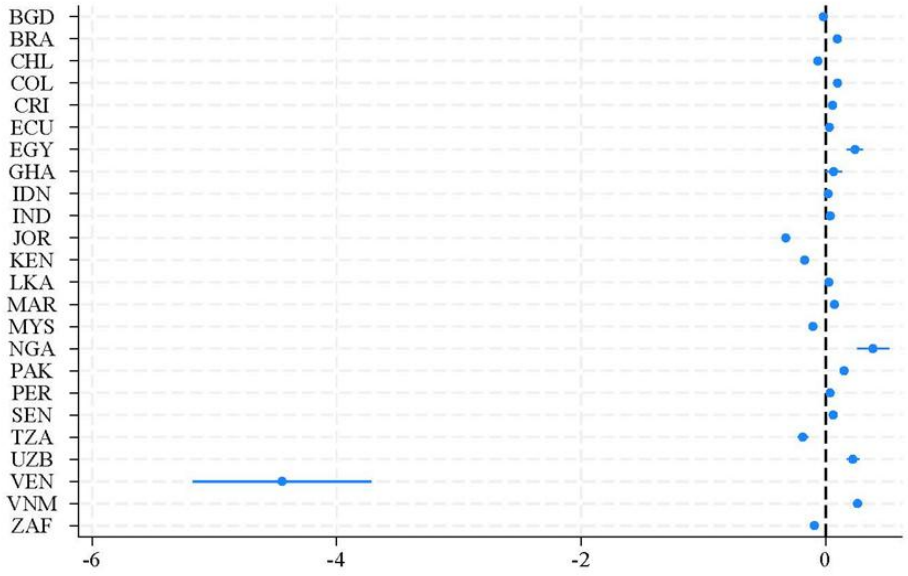
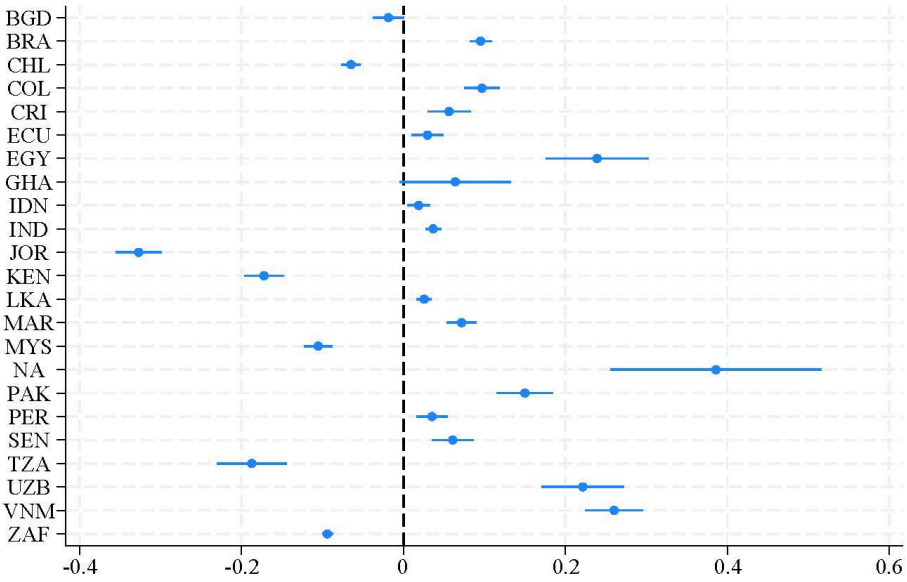


Figure 16. Country-level coefficients for the CAPMF × Global South interaction in the PPML estimation (without Venezuela)



The demand-substitution channel operates where relocation is difficult but trade in final or intermediate goods is feasible. In such sectors, higher compliance costs or product prices lead European firms and consumers to source more goods from countries with laxer standards, even when domestic production remains in place (Tan & Bin, 2018; Demiral et al., 2022). This mechanism helps explain why some low intensity yet highly tradable sectors show positive leakage coefficients. Finally, the compliance channel affects sectors exposed to non-price regulations such as technical standards, certification, or product bans, and these compliance costs that may differ across sectors. This would create a compliance asymmetry and can result in European suppliers externalising those compliance burden onto their partners in less regulated countries. While our analysis does not suggest that compliance costs are the main driving force of relocation, this mechanism works with the first two channels, incentivizing firms to move to regions where environmental regulation is less strict. Abbasi et al., (2023) uses a similar argument when examining whether Europe's industrial emission reductions are partly due to the outsourcing of pollution-intensive production abroad. They find that despite rising economic output in the EU, industrial emissions in the EU-28 declined markedly from 1995–2011, due to increase in emissions embedded in imports. They suggest that even if environmental regulation within the EU itself is not the main driver, the strictness of its enforcement in host countries can strongly influence where industries choose to relocate. Saussay and Soilita (2023) find that policy type also determines outsourcing decisions by firms, with environmental taxes having twice the effect of standards in driving cross-border investment and firms react more strongly to market-based instruments (taxes, permit prices) than to command-and-control standards.

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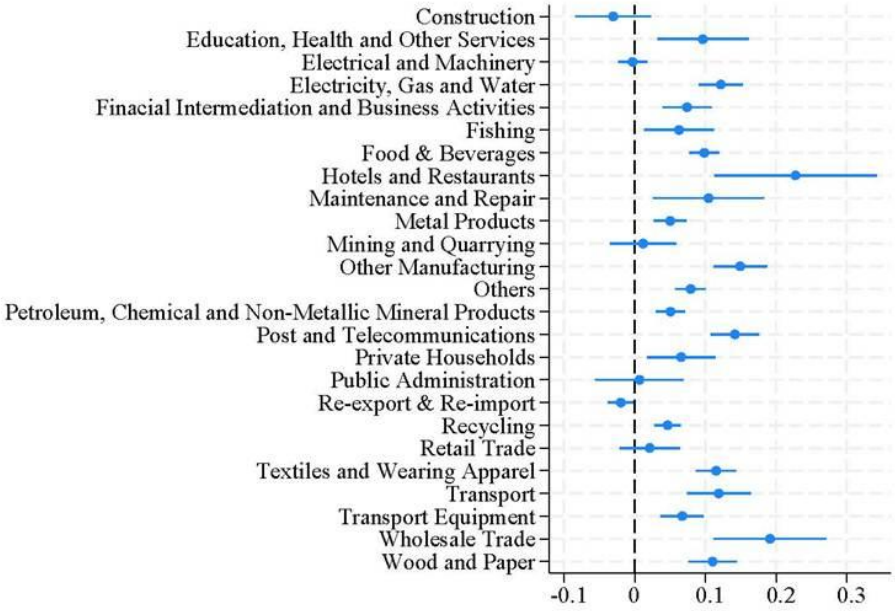
Figure 17. Sectoral coefficients for the impact of EU CAPMF on imported emissions



In summary, the domestic and international analyses together reveal the dual nature of Europe's green transition. While stricter environmental policy stringency can increase inequality within countries, an effect largely mitigated through social spending and redistribution, it simultaneously externalises part of Europe's carbon footprint to less regulated economies through trade. This interplay between domestic adjustment and international displacement underscores that social compensation mechanisms exist nationally, but not globally, highlighting the need for policy coordination that balances climate ambition with both social and global justice.

Main results

In terms of distributional outcomes, the analysis finds that stricter environmental policies are associated with higher inequality in Europe. Specifically, a 10% increase in environmental policy stringency raises the pre-tax Gini by about 0.3% and the post-tax Gini by 0.5%, while having no statistically significant effect on the disposable Gini. These findings indicate that direct cash transfers, which are captured in the disposable Gini measure, help offset the regressive impact of climate policies. Unemployment is found to exacerbate both pre-tax and post-tax inequality, reflecting the vulnerability of low-income groups to structural job losses during the transition. By contrast, higher levels of social public expenditure consistently reduce inequality across all three Gini measures, underscoring the role of welfare systems in cushioning the social costs of decarbonisation. Overall, these results point to the social and socio-economic costs of the green transition, rising inequality and uneven burden-sharing, but also to important social benefits, as welfare and fiscal mechanisms significantly mitigate these effects.

In terms of environmental outcomes, the results show that higher environmental policy stringency in Europe is strongly associated with higher levels of imported emissions from Global South countries. A 10% increase in policy stringency leads to a 1.3% rise in emissions embodied in imports, suggesting that part of Europe's decarbonisation effort is achieved through the offshoring of carbon-intensive production. Disaggregated results confirm that imported emissions increase

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across most sectors and exporter countries in the Global South, indicating a broad pattern of carbon leakage rather than a sector-specific effect. These findings highlight both the environmental benefits of the green transition, reductions in territorial emissions and strengthened climate protection within Europe, and its environmental costs, namely the externalisation of emissions that undermines the global effectiveness of domestic decarbonisation.

The results from both analyses were confirmed by robustness checks, reinforcing the validity of these findings across alternative model specifications. Together, they underscore that while Europe's green transition delivers measurable environmental gains, its social and environmental costs are unevenly distributed, both within countries and across global production networks.

Discussion and conclusions

Reflecting on the empirical results of this study through the lens of the GreenPaths analytical framework, we can link the domestic and international findings to broader questions of environmental sustainability and social wellbeing. This case study analyses the consequences of environmental policies on distributive outcomes within Europe and environmental spillovers across its trade partners in the Global South. In doing so it contributes to GreenPaths' central objective of understanding how green transition policies in Europe can be socially fair, economically viable, and environmentally effective. By combining inequality and trade-emission analyses, our case study brings together two core dimensions of GreenPaths, social and environmental justice. Thus, revealing how policies that can reduce territorial emissions may also redistribute costs and benefits unevenly across people and places.

The GreenPaths analytical framework allowed us to shed light on two interrelated justice dimensions through this case study: distribution and recognition. Viewed through this lens, we find that the domestic analysis exposes the distributional dimension: stringent environmental policy tends to raise inequality before redistribution, but strong welfare institutions can mitigate these effects through targeted cash transfers and social spending. The international analysis, in turn, highlights that the benefits of European decarbonisation are partly achieved at the expense of partners in the Global South, where weaker environmental regulation and limited governance in global governance result in an unequal sharing of transition burdens. Together, the two analyses highlight potential injustices contained in Europe's green transition, where social costs are redistributed within nations, but negative environmental externalities affect partners globally.

In terms of distributional justice, the domestic analysis shows that stringent environmental policies, while essential for decarbonisation, can produce short-term regressive effects through labour-market and price mechanisms. As EPSI rises, the costs of energy and transport go up, and employment in carbon-intensive sectors declines, disproportionately affecting low-income and low-skilled workers (Baran et al., 2020; Chateau et al., 2018). But this outcome is not simply a loss of employment and income, but it represents a structural inability of the system to reintegrate those put out of work due to the transition as brown sector workers struggle to transition to other jobs. These struggles are further accompanied by wage stagnation and long-term decline (Kyriacou et al., 2024). This is particularly evident in cases where reskilling programs are inadequate or fail to match market demand, exacerbating labour market segmentation and inequality (Chun, 2024; Seo, 2021). Yet the analysis also reveals an important counterbalance from the state; higher social spending and progressive fiscal policies can offset much of the inequality generated by increasingly stringent environmental policies. This echoes GreenPaths' emphasis on the social impact processes of transition, specifically the relationship between employment, income, and welfare resilience, demonstrating that fiscal and social integration can ensure decarbonisation with social wellbeing.

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The international component of this study extends the notion of distributional justice beyond European borders, uncovering the spatial redistribution of environmental costs. Rising EPSI levels associated with higher embodied CO_2 imports from Global South partners indicate that part of Europe's mitigation success is achieved through carbon leakage rather than absolute emission reduction. This points to the absence of a global policy on shared regulatory standards and redistributive mechanisms at the international level to prevent inequalities between high- and low-income regions. While welfare states can internalize and buffer domestic social costs, there are no similar instruments at the international level to prevent the externalization of environmental burdens in the green transition. That is one concern that the Carbon Border Adjustment Mechanism (CBAM) may be able to address (Bellora, 2023), although some ex-ante research finds that the effectiveness of the CBAM to address carbon leakage risks can be expected to be rather limited (Sun et al., 2024). This asymmetry is further reinforced when we consider that the Just Transition Funds and other regional support mechanisms at least partially recognize and support disadvantaged workers and regions within Europe. Verdolini et al. (2024) provide a detailed report on what the EU has done to support disadvantaged workers and regions affected by the green transition, especially those dependent on coal, fossil fuels, or carbon-intensive industries, through for example, the European Social Fund, or aiding coal-dependent areas like Silesia via the Coal Regions in Transition Platform. Under the European Green Deal, the Just Transition Fund and Mechanism now channel billions toward reskilling, job creation, and green regional development (Verdolini et al., 2024). In contrast, the ecological costs borne by producers and exporters in the Global South have been only partially addressed in European policy design, often considered indirectly through mechanisms such as the Carbon Border Adjustment Mechanism (CBAM) rather than through broader social or developmental frameworks.

The distributional consequences of this leakage are particularly concerning for exporting countries because many of these countries already face structural barriers to implementing stringent environmental policies in terms of limited fiscal resources, weak regulatory institutions, and competing development priorities (Sadik Zada and Ferrari, 2020). Consequently, production displaced from Europe and relocated to regions with lower enforcement capacity amplifies global inequities in environmental governance.

The two analyses together show how economic, social and environmental indicators interact and how current policy evaluation falls short in terms of fully integrating the three dimensions. The approach adopted in this study of bridging inequality, welfare, and trade demonstrates that integrating multidimensional indicators can reveal asymmetries and trade-offs that one-dimensional analyses can overlook. This case study thus contributes to GreenPaths' comparative understanding of how policy coherence and institutional design determine whether green transitions reinforce or alleviate inequality, both within Europe and globally.

Taken together, the domestic and international analyses reveal a two-sided outcome of European environmental policy stringency. Domestically, higher EPSI initially increases inequality through labour-market and price effects but is largely offset by redistributive welfare mechanisms. Internationally, however, the same policies externalise part of Europe's carbon footprint to less regulated economies, generating trade-based carbon leakage. This pattern illustrates the asymmetric effect of stringent environmental policy where social costs are redistributed within Europe via welfare systems and public social spending, while environmental costs are redistributed globally via trade channels. Both outcomes arise from the asymmetric capacities of domestic welfare systems and global regulatory frameworks: whereas European welfare states can cushion income shocks through transfers and social spending, global governance lacks equivalent mechanisms to address environmental spillovers. Hence, the combined results point to a critical tension in green transition policies, effective domestic mitigation coexists with global

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inequities unless complemented by coordinated carbon pricing, technology transfer, and just transition mechanisms that internalize cross-border impacts.

Recommendations

Integrate welfare design into climate strategy at EU level: Environmental policy stringency should be developed alongside targeted welfare measures at the European level to protect low-income and vulnerable groups during the transition.

Prioritise direct cash transfers and progressive taxation: Evidence shows that disposable income inequality remains stable when redistributive instruments are in place. Expanding cash-transfer schemes and revenue recycling from carbon pricing at the European level can help maintain fairness while preserving abatement incentives.

Invest in reskilling and labour-market transitions: Labour-market vulnerability is a key social cost of decarbonisation. Active labour policies regarding training, relocation support, and job guarantees, should accompany sectoral phase-outs to prevent long-term inequality.

Monitor distributional impacts systematically: Include social indicators (e.g. inequality, energy poverty, employment) in environmental policy evaluation frameworks to ensure that social costs are identified early and mitigated proactively.

Link fiscal and environmental policy frameworks: The analysis shows that high social expenditure mitigates the inequality effects of environmental stringency. Fiscal and climate policy planning should therefore be coordinated to prevent adverse, social outcomes.

Recognise and manage carbon leakage as a social issue: Beyond its environmental implications, carbon leakage redistributes production and employment risks to less regulated economies. EU policies should incorporate social safeguards for affected trade partners.

Broaden the scope of the Carbon Border Adjustment Mechanism (CBAM): While CBAM addresses price distortions, it should evolve to include developmental cooperation, capacity-building, and technology transfer measures that support exporters in meeting higher environmental standards.

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1.11 Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?

Overview

Hydrogen has been hailed, particularly by the EU, as one of the key energy carriers for the green transition (European Commission, 2021). The fact that hydrogen does not release CO2 when burned, and its possible utilisation as a fuel in hard-to-abate sectors, has made it popular among EU policymakers. The transition to a renewable hydrogen economy, however, is not without its issues. While it is true that hydrogen can be created in a 'renewable' manner through electrolysis - using renewable electricity to split water into hydrogen and oxygen -, this technology is not yet widely used. As a matter of fact, 95% of hydrogen in the EU is created from fossil fuels, either by using coal, fossil gas or as a byproduct of producing plastics (Deasy-Millar et al., 2025). Whereas hydrogen that is produced with electrolysis that uses green electricity is called 'green hydrogen', fossil-based hydrogen is called either 'brown' or 'black' (depending on the type of coal) or 'grey' (gas), and the latter is the most common form of hydrogen (Deasy-Millar et al., 2025). There is one more – contentious – category of hydrogen: 'blue' hydrogen. Blue hydrogen is fossil-based hydrogen that has had the carbon generated captured during the generating process with carbon capture and storage (CCS). Blue hydrogen is contentious because it is unclear how 'clean' blue hydrogen is, with some authors suggesting that emissions from blue hydrogen could even exceed the emissions of grey hydrogen (Howarth & Jacobson, 2021;). The two main problems for blue hydrogen are methane leaks (which cause more warming than CO2) and the need for fully functional CCS (Bauer et al, 2022). Doubts have been raised about the extent to which these two problems can be avoided at scale (Howarth & Jacobson 2021; Mohideen et al 2023). The EU, however, has still decided that blue hydrogen is part of the transition to a green hydrogen economy and termed it low-carbon hydrogen in the delegated act on low-carbon hydrogen (European Commission, 2025).

In any event, only 1.1 percent of all hydrogen production capacity is currently either 'green' or 'blue' (Deasy-Millar et al., 2025). With only 571 MW of electrolyser capacity installed in Europe, less than a tenth of the EU hydrogen strategy goal of 6GW production capacity by 2025 has been realized (Deasy-Millar et al., 2025). This is somewhat surprising considering the large-scale investments that have been put into green hydrogen production. The Commission has allowed nearly 20 billion Euros in state aid under its Important Projects of Common European Interest (IPCEI) programme since 2022, however only 21% of these projects have reached a final investment decision (FID) (Collins, 2025). Moreover, hydrogen overall has seen a 15% fall in demand in 2024 compared to 2020 (Deasy-Millar et al., 2025). These data show that the economic promises of green hydrogen have not yet come to fruition and green hydrogen production (in Europe) may still be too costly. What is more, even 'green' hydrogen is not without its environmental trade-offs because its production requires a large deployment of renewable energy,large amounts of water, land, and critical materials (Terlouw et al., 2025). Considering the Commission's focus on importing hydrogen from regions which are currently experiencing water shortages such as Morocco and Egypt, hydrogen production may have severe environmental consequences as well (Müller et al., 2022).

This paper studies the social impacts of the EU green hydrogen economy policy. It takes an energy justice perspective to understand the social impact of green hydrogen production in two particular localities which have been singled out as sites of large-scale projects: Groningen in the north of the Netherlands and the Western Sahara, a region recognized in international law as a non-self-governing territory, to which Morocco has territorial pretensions. Social impact assessments on (renewable) energy projects and systems, such as the EU-endorsed SLC-A, currently do not

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(sufficiently) assess the justice of green transitions (Fortier et al., 2019). This study builds on existing energy justice approaches to formulate an energy justice approach towards understanding the social impacts of green hydrogen and applies the resulting assessment framework to green hydrogen projects in Groningen and Western Sahara.

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Research questions

Building on the existing knowledge and in line with the broader goal of the GreenPaths project this study seeks in particular to understand how European policies for the transition to a green hydrogen economy impact energy justice. To gain a detailed perspective of these impacts, it focusses on two regions that have invested heavily in the hydrogen economy and feature centrally in the policy approach: Groningen in the Netherlands and the Western Sahara and Morocco. Groningen has one of the first hydrogen valleys and is an important part of the 'backbone infrastructure' of the EU (the grid of pipelines which will carry hydrogen throughout Europe), Morocco on the other hand is one of the 'neighbouring' countries that is investing heavily in hydrogen production for the European market, among others in the occupied Western Sahara region. The study thus asks the following question:

How does the European policy framework on green hydrogen production impact energy justice in Groningen, Morocco, and the Western Sahara?

To answer this question the study uses the following sub-questions:

- How can energy justice be operationalised in the green hydrogen transition?
- What is the European policy approach to green hydrogen production in Europe and its neighbouring regions?
- How does EU green hydrogen policy impact energy justice in Groningen?
- How does EU green hydrogen policy impact energy justice in Morocco and the Western Sahara?

This case study seeks to zoom into the energy justice dimension of the green transition to the European hydrogen economy. Energy justice is an emerging concept that has developed from work on environmental justice as a distinct approach to the inequalities that may accompany the introduction of new energy projects and energy systems (Jenkins et al. 2016, Sovacool & Dworkin 2015). Environmental justice frameworks often take multiple dimensions of justice to be part of their concept of justice (Schlosberg, 2004). In the case of energy justice, the three central justice tenets that were introduced by McCauley et al. (2013) have remained central to its conceptualization: distributive justice, recognitional justice and procedural justice. These concepts of justice interact to understand the full process of *in*justice:

> "Energy justice, our focus throughout, evaluates (a) where injustices emerge, (b) which affected sections of society are ignored, (c) which processes exist for their remediation in order to (i) reveal, and (ii) reduce such injustices" (Jenkins et al. 2016, p 175).

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These dimensions always include distributive justice, procedural justice and recognition justice, but have been extended with other dimensions such as restorative justice, cosmopolitan justice and epistemic justice (Sovacool & Dworkin, 2015; Jenkins et al., 2016; Müller et al., 2022). The concept of energy justice has been used in particular to understand the effects of energy policy on the justice of contemporary energy systems (McCauley et al., 2013). In this paper we will work with the three central dimensions of energy justice which require some elaboration.

Distributive justice

Within energy justice, distributive justice asks how the benefits and ills of energy production and consumption are distributed in society (McCauley et al., 2013). It recognizes the unequal distribution of both the physical allocation of benefits and ills and their associated responsibilities (Walker, 2009; Jenkins et al., 2016). Distributive justice is concerned both with the siting of energy infrastructure and the access to energy services (Jenkins et al., 2016). It 'represents a call for the distribution of benefits and detriments across all members of society regardless of income, race, etc.' (Heffron et al., 2015, p. 169). Within the field of hydrogen, distribution questions have centred around 'the potential benefits the hydrogen could produce as well as how costs and the externalities may be distributed' (Dillman & Heinonen, 2022).

Recognition justice

Recognition justice asks whether individuals are fairly represented, free from physical harm and offered complete and equal rights (McCauley et al., 2013). It is in this way different from procedural justice aspects, instead looking at "the process of disrespect, insult and degradation that devalue some people and some places' identities in comparison to others" (Walker, 2009: 615; Heffron et al., 2015). Nancy Fraser identifies three types of misrecognition that take place: cultural domination, non-recognition, and disrespect (Fraser, 2008). By identifying what groups may face discrimination or disproportionate effects, recognition justice seeks to identify vulnerabilities (Dillman & Heinonen, 2022).

Procedural justice

Procedural justice asks whether there are equitable decision-making procedures that make sure all groups are able to participate in a non-discriminatory way and that their decisions are taken seriously throughout (McCauley et al 2013). It concerns fair and equal access to legal procedures, policymaking and transparency of information from the relevant institutions (Jenkins et al. 2016). In the words of Heffron et al. (2015, p. 917): 'It unites distributional and recognition-based justice through a combined demand for both formal and informal forms of involvement in decision-making'.

The concept of energy justice is increasingly applied to the (green) hydrogen economy. Geographically most of these authors have focused on the justice implications and risks of the green hydrogen economy for the global south (Patonia, 2025; Müller et al. 2022; Kalt et al., 2023; Tunn et al., 2024). Energy justice perspectives give a more comprehensive and interconnected framework of understanding the social impacts of large-scale energy transitions. In this way the energy justice approach helps to develop a systemic, in-depth and innovative understanding of green transition policies and approaches and their social impacts and trade-offs, which is the

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primary objective of the GreenPaths case studies. An energy justice perspective thus not only asks what impacts take place, but also who gets disproportionately impacted and whether these impacts can be addressed through formal and informal procedures.

The case study utilizes the GreenPaths Methodological Matrix. Our case study is particularly interested in the cross-sectoral and holistic social impact process of injustice and inequalities. To do so **we investigate the concepts of sustainable growth and decarbonization at the project level as policy surrounding the EU green hydrogen is firmly embedded in narratives of (sustainable) growth and decarbonisation**. Within these concepts it works within the sectoral concepts of **renewables and fossil fuel phase ou**t. The EU hydrogen economy is explicitly meant to be a technology to phase out fossil fuels and replace them with hydrogen as a renewable alternative. At the level of the case study the concepts **hydrogen, new extractivism and green/ land grabbing** have been utilized, as these concepts are used generally within energy justice frameworks and can help give an understanding to the social impacts. Zooming into these topics as part of our assessment framework we were able to link these processes of social impact to the specific case of the hydrogen economy and the framework of energy justice.

Methods

The case studies employed mixed methods relying both on (pre-existing) quantitative indicators and desk study of legal and policy documents and secondary reporting. First, a legal doctrinal study and literature study were done to outline the relevant EU policy in the field of hydrogen, with a particular focus on the policies that are most relevant for the geographical regions that we are interested in: Groningen, Morocco and the Western Sahara. After setting out the policy framework, a selection was made of the key policies to be considered in this study, the policy framework on (green) hydrogen is very extensive and as such five European policies that focus on green hydrogen production were expressly selected to study in the case study: the European Hydrogen Strategy, the REPowerEU plan, the Renewable Energy Directive III, and the Decarbonised Gas Market Package.

The assessment framework for the case study was the result of a literature review into energy justice and social impact assessment of green hydrogen projects and systems (Jenkins et al., 2017; Zamagni et al. 2025; Tunn et al., 2024; Dillman & Heinonen, 2022; Patonia, 2025). The operationalisation of energy justice in the literature is rather diverse, with the dimensions or types of justice ranging from 3 to 7 different categories of justice. Measuring energy justice has been the source of much debate. The literature proposes a wide range of metrics that may be relevant in understanding the justice dimensions of energy systems. Many of these general frameworks for measuring energy justice focus on energy accessibility, energy affordability, environmental and health metrics, economic participation and ownership and, procedural justice and democracy (Baker et al., 2023; Lanckton & DeVar, 2021; Apergi et al. 2024). Because the hydrogen economy is in many ways indeterminate (Dillman & Heinonen, 2022), the analysis has sought to analyse not only current social impacts, but also the risks of future social impacts.

The study does not use a Social Life Cycle Analysis (SLCA) methodology because it does not focus on specific technologies of hydrogen production and aims to understand what social impacts take place at the site of hydrogen production and use. It should be borne in mind, however, that the social impacts of hydrogen production span much further than the site of production. Risks of exploitative and adverse labour conditions (child labour, forced labour, accidents and bargaining rights) and risks to local communities (water use and migration) have been shown to be prevalent in the hydrogen supply chain (dos Reis et al., 2024, Martin-Gamboa et al., 2025; Akhtar et al., 2023, Werker et al., 2019). The insights of these analysis have been incorporated where applicable.

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To do so it considers indicators and research along different elements of energy justice. For distributive justice it looks at indicators on **energy access and affordability, wealth and ownership distribution and environmental impacts**. Recognition justice looks at indicators centred around **recognition, misrecognition and indigenous rights**. Procedural justice looks at indicators on **public participation, transparency and due process**. In selecting the indicators to be used, we used the GreenPaths Methodological Matrix data set and identified additional indicators and topics from the literature review. These topics and indicators were paired with specific (public) data sources from renowned institutions such as the World Bank, EUROSTAT, IRENA, IEA, World Economic Forum and from policy documents of the EU, the Dutch government and the Moroccan government among others.

Findings and results

EU Hydrogen Policy

The EU has put considerable effort into making hydrogen the fuel of the future. In its hydrogen strategy the EU Commission sums up the main reasons why:

> 'Hydrogen can be used as a feedstock, a fuel or an energy carrier and storage, and has many possible applications across industry, transport, power and buildings sectors. Most importantly, it does not emit CO2 and almost no air pollution when used. It thus offers a solution to decarbonise industrial processes and economic sectors where reducing carbon emissions is both urgent and hard to achieve. All this makes hydrogen essential to support the EU's commitment to reach carbon neutrality by 2050 and for the global effort to implement the Paris Agreement while working towards zero pollution.' (Commission, 2020, p. 1)

The Commission, thus, sees a great future for hydrogen in meeting the global climate commitments. The EU strategy on hydrogen seeks to materialize this reality through a three 'phase' approach. In the first phase, which ran from 2020 to 2024 and has just ended, the objective was to install at least 6 GW of renewable hydrogen electrolysers in the EU and produce up to 1 million tonnes of renewable hydrogen (European Commission, 2020). The focus in this first phase would be on setting up smaller hydrogen production sites that would give local supply of green or blue hydrogen to existing users of hydrogen. Existing hydrogen production was to be retrofitted with carbon-capture technologies and future medium-range and 'backbone' infrastructure would be planned. This initial phase would mainly be concerned with setting up a regulatory framework for a hydrogen market and enabling supply and demand. The regulatory framework came in the form of the Hydrogen and the Decarbonised Gas Market Package which sets out rules among others on tariffs, third party access to infrastructure and transparency requirements in Regulation 2024/1789 and market rules on competition and consumer protection in Directive 2024/1788. To enable supply, investment was encouraged among others through the Green Hydrogen Alliance, a platform that brings together industry stakeholders and 'bridging the cost gap between conventional solutions and renewable and low-carbon hydrogen and through appropriate State aid rules' (European Commission, 2020, p. 6)

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The second phase, from 2025-2030, sees hydrogen become 'an intrinsic part' of the energy system with the objective to install 40 GW of renewable hydrogen electrolysers and the production of 10 million tonnes of renewable hydrogen (European Commission, 2020, 7). This is the time when demand is geared up for industry and transport. The Commission has done so through uptake requirements of green hydrogen for industry that were introduced in the revision of the Renewable Energy Directive (REDIII) (Directive 2023/2413). These uptake requirements for green hydrogen (or 'renewable fuels of non-biological origin (RFNBOs)) ask for an uptake of green hydrogen by 2030 of '1% of total energy supplied to the transport sector, and at least 42% of all hydrogen used in industry, increasing to 60% in 2035' (European Commission n.d.). To prevent this hydrogen production from harming the green transition in other areas two criteria for RFNBOs were introduced: additionality and temporal and geographic correlation. Additionality requires green hydrogen production to come from new and unsupported renewable energy generation (European Commission, n.d.). Temporal and geographic correlation meanwhile requires that green hydrogen is made only when and where it is available to prevent further fossil use (European Commission n.d.). In the second phase hydrogen 'valleys' will be developed in remote areas, islands and regional systems: these are places where hydrogen production and demand are clustered and situated closer together to cover the entire value chain from production to consumption (European Commission, 2020, p. 7). The second phase also seeks to introduce large scale transport of hydrogen, with a pan-European transport infrastructure and hydrogen trade, in particular with the EU's neighbouring countries. In terms of policy, the EU hopes to scale up through 'gearing up EU's support and stimulate investments to build a fully-fledged hydrogen ecosystem' (European Commission, 2020, p. 7), with the final aim of 'an open and competitive EU hydrogen market, with unhindered cross-border trade and efficient allocation of hydrogen supply among sectors' (European Commission, 2020, p. 7).

The third phase, from 2030 onwards and towards 2050, would see renewable hydrogen technologies reach maturity and be deployed at large scale to reach all hard-to-decarbonise sectors (European Commission, 2020, p. 7). The Commission adds that this requires a massive scale up in renewable energy production as 'about a quarter of renewable electricity might be used for renewable hydrogen production by 2050' (European Commission, 2020, p. 7).

The goals set out in the EU hydrogen strategy were further raised in the Commissions REPowerEU plans (European Commission, 2022). The Commission plan was set up in response to the energy market disruptions caused by the Russian invasion of Ukraine with the aim to reduce the EU's dependence on Russian fossil fuels. Hydrogen is identified in the REPowerEU as one of the six ways to increase the resilience, security, and sustainability of the EU's energy system. On hydrogen, the Commission set the key indicative target of 10 million tonnes of domestic hydrogen production and 10 million tonnes of imported renewable hydrogen by 2030 (European Commission, 2022).

Case 1: Groningen, The Netherlands

Within the EU, a select group of countries have invested heavily in (renewable) hydrogen. The Netherlands is one of them. The Netherlands has a historically large fossil industry, in no small part because of the discovery in the late 1950's of the 'Groningen gas field', one of the largest fields in Europe. Exploitation started in 1963 through the public-private partnership 'Gasunie' and the gas field remained a massive boon to the Dutch treasury (and the state's fossil partners Shell and ExxonMobil) until its closure in 2022 (Tweede Kamer, 2023). Its closure was due to public pressure in response to land subsidence and earthquakes that were the result of the

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exploitation of the field (Tweede Kamer, 2023). The closure of the field meant a recognition for the local population, with the main conclusion of the Dutch parliamentary inquiry into the closure of the fields being: 'as far as gas extraction is concerned, the interests of the people of Groningen were ignored on a structural basis' (Tweede Kamer, 2023, p 7.). The closure of the field, however, would also have social impacts, with a Commission JRC report discussing the risk of stranded assets and jobs along the gas value chain reporting risks for thousands of jobs and billions in stranded assets (Spisto et al., 2020). However, the report also already identifies mitigating pathways, among others in the form of hydrogen. Hydrogen would allow much of the infrastructure to be repurposed and many of the skilled workers to remain in the region (Spisto et al., 2020). This is part of why the Northern Netherlands has decided to invest heavily in Hydrogen and to set up the first EU hydrogen valley. Most of the activities of this valley are concentrated in Groningen. The national and local policy framework surrounding the production of Hydrogen in Groningen consist particularly of the Dutch climate agreement (Klimaatakkoord, 2019), the National hydrogen programme (Nationaal Waterstof Programma) and its Routekaart Waterstof (Hydrogen Roadmap, 2022), and the National Energy Programma (NPE, 2023). These national policies have set out a goal for 600 MW of hydrogen production in 2025 and 6-8 GW of production by 2030 (Nationaal Waterstof Programma, 2022).

Case 2: Morocco and the Western Sahara

Morocco plans to develop green hydrogen production to satisfy its own needs for sustainable ammonia and fuels, and also to become a significant exporter (Green Hydrogen Organisation, n.d.). To produce green hydrogen, Morocco needs electricity from renewable sources. The share of renewables in its electricity generation in 2022 was around 17% (IEA, 2022). In its 2021 roadmap on green hydrogen, Morocco set out an ambitious roadmap for green hydrogen production, estimating a total (international) demand for hydrogen equivalent to 8 GW of production capacity in 2030, going to 37 GW in 2040 and 87 GW in 2050 (Kingdom of Morocco, 2021).

To reach its goals, Morocco launched the Moroccan Offer (MASEN, 2025), a call for direct foreign investment in integrated renewable energy and green hydrogen projects, promising various incentives and favourable conditions for investment. Projects under construction are praised by officials as creating jobs, busting the economy and contributing to sustainable development (see e.g. Toutate, 2025). Many of these projects are, however, planned in the Western Sahara. The Western Sahara was a Spanish colony until 1975, when it was annexed by Morocco. Since then, it has been the site of a territorial dispute between Morocco and its indigenous Saharawi population under the Sahrawi Arab Democratic Republic (SADR), led by the Polisario Front (BBC, 2024). Neighbouring Mauritania also has claims on the Western Sahara; the International Court of Justice found in its 1975 advisory opinion that, although both Morocco and Mauritania had legal ties with the Western Sahara, these were not legal ties of sovereignty meaning that the Saharawi people have a right of self-determination. The fighting lasted until 1991, when a UN brokered peace deal was struck and a referendum on independence was announced. The referendum was never organised, however, and Western Sahara remains designated as a non-self-governing territory (UN , n.d.). The dispute has since mainly played out at the UN centring around Algeria, which houses the leadership of the Polisario front and up to 200.000 Sahrawi refugees, and Morocco (Associated Press, 2025). At the UN, Morocco has sought support for a proposal to keep the Western Sahara as an autonomous region in the Kingdom of Morocco, with increasing success in recent years, in particular with backing from the UN security council in Resolution 2797 (Associated Press, 2025; Faouzi, 2025).

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Distributive justice

Access to affordable and reliable energy

The first topic that is considered here is the access to affordable and reliable energy. Because the Netherlands is a very wealthy country, many of the metrics for **energy accessibility** indicate full access to electricity for citizens and a supply of 121.157 GWh of which 48.315 (40%) came from renewable sources (IRENA, 2022). The overall share of renewables in total energy usage is low, with only 11% of energy coming from renewable sources (IRENA, 2022). There are two important justice concerns in the area of access to energy: first, whereas all current housing is supplied with electricity, the Dutch energy infrastructure is extremely overburdened with 14.044 businesses waiting for a heavy electricity connection and 8.539 businesses waiting for a feed in connection to deliver electricity to the grid. These requests add up to a staggering 9.131 MW capacity on the waiting list and 4.591 MW waiting for a feed in (Netbeheer Nederland, 2025). This pressure on the grid also affects housing development with a number of housing developments being delayed over a lack of connection to the grid (Netbeheer Nederland, 2025). This comes at a precarious time when most of the Netherlands faces a housing crisis, with a shortage of 396.000 houses in 2025 (Ministerie van Volkshuisvesting en Ruimtelijke Ordening, 2025). Future and existing hydrogen projects require a connection with the grid (ter Berke et al., n.d.) and although the possibility of hydrogen as a means to 'balance the grid' is mentioned, this relies on large scale hydrogen storage (Ter Berke et al., n.d.). Energy infrastructure will likely further be strained when hydrogen projects are added to the grid. Not only the access but also the affordability of renewable energy is strained by the introduction of largescale electrolysers (Bindi et al. 2025). This problem is exacerbated by the difficulties of the Netherlands to tender offshore wind production at scale which has also been signalled by the responsible ministry (Hermans, 2025). From the perspective of **affordability** another issue is that the Groningen region has one of the highest rates of energy poverty in the Netherlands, at 8.6% in the Province of Groningen and 9% in the Eemsdelta region of Groningen where most of the Hydrogen production takes place (Mulder et al., 2023). Meanwhile the country is struggling with high (renewable) energy prices since the war in Ukraine started, leading to windfall profits for energy companies and extremely high energy costs for consumers (Nicolay et al., 2023). Energy prices have cooled somewhat in the meantime with the average cost of energy being 1.628 Euro per cubic meter of gas and 0.233 Euro per kWh of electricity for households over 2024 (CBS, 2025). At the same time industry prices are substantially lower with 0.487 per cubic meter of gas and 0.132 Euro for a kWh of electricity for large industrial energy users over 2024 (CBS, 2025). The price of energy in the Netherlands is higher than the EU average, both for households and industrial electricity use (which is the highest in Europe according to the Commission (2025)). The rationale behind substantially lower prices for industry and high subsidies for renewable energy projects is that Dutch industry cannot compete internationally without these subsidies (Anderson et al., 2023). Research however also suggests (renewable) energy subsidies have led to windfall profits in the past (Hulshof & Mulder, 2022).

In Morocco, access to energy is also reported at 100 percent; in 2023 total electricity production was 41.503 GWh with 7.237 GWh (17%) coming from renewable sources (IRENA, 2022). Morocco is heavily dependent on imports, with roughly 90 percent of energy being imported (IRENA, 2022). One of the key reasons for Morocco to focus on green energy is to create energy independence, however, the focus on green hydrogen production for export seems to undercut this energy independence (Tunn et al., 2022; Müller et al., 2020). In terms of affordability, 14 percent of Morocco experiences energy poverty (Kettani & Sanin, 2024). The Western Sahara region meanwhile sees a large amount of power cuts that are likely related with political reasons (figuring frequently on Sahawari National days and during demonstrations)

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(Allan et al., 2022). Energy poverty also features heavily in the Western Sahara region, with reports of people paying large shares of their income on energy bills, energy 'poaching' through clandestine connections and some people not having a connection at all (Allan et al., 2022). Allan et al. (2022) thus deem electricity an 'exclusive' resource in the Western Sahara, with energy access and affordability utilised in colonial oppression. Unfortunately, there is no data available on the extent of power cuts, energy poverty and access to energy in the Western Sahara. There is a clear risk, however, of further amplifying these inequities when companies establish large scale infrastructure in the Western Sahara region.

Wealth, financing and ownership

Turning to the distribution of wealth and ownership, there is a clear indication that the risks are socialized whereas the benefits are privatised. Outside of the infrastructure, there is no public ownership in the hydrogen economy and there are no community benefit agreements. What is more, fossil majors are currently benefiting the most from subsidies to produce green hydrogen. High energy prices further exacerbate the already strained financial picture for green hydrogen production in the Netherlands. Research concludes that under market circumstances in 2021: "an investment in a 100 MW electrolyser plant needs almost all its investment costs subsidized in order to become break even" (Veenstra & Mulder, 2024, p. 11). This was attributable to the fact that fossil gas-based power plants were the 'price setting' plants and the lack of available green energy. The research concludes that "to make an investment in electrolysis profitable with lower subsidy requirement, the amount of renewable electricity generation needs to grow significantly, or the carbon prices need to be much higher" (Veenstra & Mulder, 2024, p. 11-12). Other research comparing the market conditions between low-carbon hydrogen production at a favourable location with the most efficient transport method and low-carbon hydrogen production in Northwest Europe found that the production of low carbon hydrogen (blue and green) has the lowest cost in Morocco compared to Northwest Europe (Perey & Mulder, 2023). With much of the186ublicc investments centring around subsidizing the 'business case' of fossil majors (Moerenhout et al., 2024). This is also true in the case of the Netherlands and Groningen where generous subsidy schemes have been set up to finance green hydrogen projects. In the latest round of the financing scheme, hydrogen producers could gain up to 80 percent of the of setting up green hydrogen facilities and 4 euro per kgh2; in comparison, the levelized cost of 'grey' hydrogen is 0.262847965 €/KgH2. The difference is roughly 16 times the original price, most of which gets paid from subsidies by the government: according to Dutch government, 'It is assumed that the government covers 75-90 percent of the added costs of producing RFNBO's' (Hermans, 2025b, p. 3). This puts into question the efficiency of producing green hydrogen in the Netherlands in the first place, something that has also been signalled in the literature (Perey and Mulder, 2023; Van der Zwaan et al., 2021).

In terms of ownership, wealth and financing a number of problematic relationships arise in the context of hydrogen production in Morocco. First, the relationship between the EU (including its multinationals) and Morocco is considered problematic from a distributive perspective. Morocco is investing large amounts of public funds to attract Western multinationals that will produce hydrogen to export to the EU (Faouzi, 2025). The Moroccan plans clearly emphasise this perspective of a strong focus on exports of Green Hydrogen. Public ownership of energy production here is not present nor are there any community benefit agreements. Arguably the most problematic dimension, however, are risks of green grabbing: 'the appropriation of land and resources for purportedly environmental ends' (Hamouchene, 2023 p. 34) and 'green colonialism'. Previous projects within Morocco's territory raise such distributive concerns in terms of green grabbing. For example, Ouarzazate is said to be one of the largest solar power plants in the world (Aoulouhaj, 2025). It takes 3,000 ha of land previously owned in common by

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the local Amazigh population (Hamouchene, 2023). All this land is said to have been expropriated without proper consultation with the local population, not to mention their consent (Hamouchene, 2023; Haag, 2022). The land was grossly undervalued. What was usually sold for 10 to 12 Moroccan Dirhams per square meter was now estimated to 1 Moroccan Dirham per square meter (Haag, 2022). It is fair to assume that this was done to lower the amount of compensation due to expropriation. The local population did not effectively receive any fair share of the money paid through the compensation for the expropriation nor did they have any say on how this money, which was placed in a special fund, is to be spent (Haag, 2022).

A more egregious form of green grabbing happens in the Western Sahara, where Morocco is realising such renewable projects on occupied land. As a matter of fact, many of the projects meant for the attainment of Morocco's renewable energy goals (as much as 30 percent of its solar energy for example (Allan et al., 2022)) are or will be located in the Western Sahara without prior consent of the local population (Western Sahara Resource Watch, 2025a). EU energy Moreover, the so called 'Moroccan offer', which came into force in March of 2024 offers foreign investors huge swathes of land (between 10,000 and 30.000 hectares) and financial support to realise green hydrogen projects (Head of Government, 2025). The first round of investment under the Moroccan offer has led to a number of international investors: 'The investor consortium "ORNX" comprises the American company "Ortus," the Spanish company "Acciona," and the German company "Nordex," which will invest in ammonia production. Another consortium, consisting of the Emirati company "Taqa" and "he Spa"ish company "Cepsa," "ill focu" on ammonia and industrial fuel production' (Kingdom of Morocco, 2025). A large share of the land allocated for these projects, however, is located in the Western Sahara (Western Sahara Resource Watch, 2025a). This land (up to one million hectares) is considered 'public land' by the Moroccan state, which has been accrued as part of its illegal occupation of the Western Sahara and the displacement of the Saharawi population (Western Sahara Resource Watch, 2023). Importantly, it has been reported that the jobs created by these projects are not available to the local Sahrawi population, but to Moroccan settlers (Müller et al., 2022).

Environmental effects

From the perspective of environmental effects, there are a number of important factors at play in the production of green hydrogen. In the case of the Netherlands environmental effects from the production of green hydrogen are likely limited. The main risk seems to come from the use of blue hydrogen instead of green hydrogen to fuel the transition. Blue hydrogen's two main risks (methane leaks and faulty CCS systems) have not been properly addressed by the European Commission in its delegated regulation on hydrogen according to climate and industry groups (Bartlett, 2025; Todts et al. 2025). In particular, the default assumptions of emissions resulting from upstream processes such as methane leakage which have allegedly been lowered under pressure from the fossil gas industry (Todts et al. 2025). Moreover, the lack of scalability of CCS systems may mean that the expected lower emissions from blue hydrogen are a paper reality (Bartlett, 2025; Todts et al. 2025). If these problems are not resolved,

In Morocco meanwhile the most notable risk of the production of green hydrogen is that of exacerbating the current water shortage in the area (Wehrey & Bonney, 2025). Morocco is facing both a water shortage and water stress (World Bank Group, 2023). These problems are further exacerbated by green hydrogen production:

> 'The water intensity of green hydrogen stresses limited water resources, which already are being depleted by rising water demand and climate change. Further constriction of water availability

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> would increase the vulnerabilities of local communities and compound the environmental and financial costs to address them' (Shehabi, 2024).

The main way in which these risks are said to be met is through desalination. Desalination, however, carries its own risks: first, desalination is expensive and requires a lot of energy, this means additional energy capacity and funding is necessary to realise desalination facilities (Shehabi, 2024). Second, there are large environmental consequences to desalination, particularly in the production of brine and other by-products of the process of desalination process (Shehabi, 2024). Moreover, desalination already further exacerbates the situation in the Western Sahara, where multiple desalination projects are set to use wind energy sourced in the Western Sahara and a desalination plant that is to be realised in occupied territory and (MacDonald, 2025; Western Sahara Resource Watch, 2025b). These plants further the dependency of Morocco on water and energy from the occupied territories and make green hydrogen production dependent on the colonial exploitation of resources.

Recognition Justice

The recognition of vulnerable and particularly affected individuals is lacking in the EU framework of public participation. The Aarhus Convention identifies two groups of people that can take part in decision making processes, the 'public concerned' and 'the public', where the public is defined as 'all natural and legal persons together with their associations, organisations or groups' (Gómez and Rehage 2024). The public concerned is defined as those individuals whose interests may be affected. These definitions do not guarantee that vulnerable or marginalized groups of people are included in the participatory processes. Gómez and Rehage (2024) thus note a blindspot in the Convention where privileged and vulnerable or marginalized individuals are treated equally despite not being equal.

Rodhouse et al. (2024) studied the dimension of recognition justice in hydrogen production in Groningen by investigating who the 'imagined publics' are, i.e. who was recognized as a subject that would be impacted by the transition. Examples of the categories of imagined publics that they found were workers that could benefit from (re-)employment, uninformed general publics, critical publics with safety concerns and households that may benefit from blending gas and hydrogen (Rodhouse et al., 2024). Most of these perceived impacts are either positive or would be positive once these people are properly informed. They found that among policymakers there were a lot of 'deficit model assumptions' about publics – the public was seen as deficient in knowledge and understanding (Rodhouse et al., 2024). Other deficiencies of the public were considered in their direct use of hydrogen where people are 'seen as motivated primarily by comfort, convenience, habit, and economic incentives (…) unwilling to accept too much change or to experience too much (temporary) discomfort for the benefit of a sustainability-driven transition' (Rodhouse et al., 2024, p. 9). These assumptions about the public influence the engagement approaches, where the aim is to minimize the impact of transitions and where the scope of opportunities for participation by publics become limited (Rodhouse et al., 2024). This is a misrecognition where previous research has shown that such assumed deficiencies are stereotypical and incorrect and pervasive in energy governance (Rodhouse et al., 2024).

Non-recognition is present in many of the Dutch policy vision documents where publics were unable to take part in the imagination and formulation of desirable and just future hydrogen systems (Rodhouse et al., 2024). In many of the vision documents no citizens, future consumers or other publics were involved being unable to establish their own position, status and roles in the transition. Another recognition problem comes from the lack of recognition of 'institutionalised knowledge, values, roles, and relationships' where large investments of public money are

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mobilized to give industrial clusters access to large amounts of hydrogen (Rodhouse et al., 2024, p. 9). Such investment is justified by referencing 'cost effectiveness, availability of renewable alternatives in other sectors, and continued economic growth', without which the Netherlands will lose its energy-intensive petrochemical and steel industries (Rodhouse et al., 2024, p. 9). This ignores the fact that such prioritization of industry is deemed unfair by large groups in Dutch society and that there has been large public resistance against this protection of fossil industries that impact people's health, living environment and the climate. This is apparent from the large-scale demonstrations against 'fossil subsidies' that have taken place over the past years (De Kleer et al., 2024) This may lead to further scrutiny from regional and local communities for example in subsurface activities around hydrogen storage. The lack of visioning surrounding (co-)ownership or (co-)production of hydrogen is another problematic feature of these visioning documents (Rodhouse et al., 2024). Moreover, the lack of involvement in vision formation may compound distributional justice concerns where the North Netherlands may again be responsible for the energy supply in the Netherlands without reaping concrete and positive benefits, contributing to the image of these regions as being exploited and used. These perspectives are further corroborated by research on the acceptability of hydrogen, where people mistrust the involvement of fossil companies and the use of blue over green hydrogen, further indicating their knowledge of hydrogen and its production (Palomo-Vélez et al. 2025)

When it comes to recognition justice in Morocco, the EU plans for a hydrogen economy have been weaponised in order to advance support for its proposal concerning incorporation of Western Sahara as an "autonomous" region. Close cooperation between Germany and Morocco on hydrogen was halted by Morocco to move Germany to support this proposal (Reyes, 2022). The German government did so in 2022, explicitly mentioning the importance of cooperation on green energy (Reyes, 2022). The findings related to distribution and recognition justice speak to the disregard of the interests of local communities, especially the Saharawi people of Western Sahara. The exploitation of the natural resources of WS and even Morocco seems to be done unilaterally, taking care of the interests of the investors only. The disregard for the Sahrawi interests was proved before the CJEU. The CJEU established that the Association Agreement between Morocco and the EU is in breach of international law as it does not provide either for explicit or implied consent of the Sahrawi people for the exploitation of Western Sahara natural resources (Judgments of the Court in Joined Cases C-778/21 P and C-798/21 P |Commission and Council v Front Polisario and in Joined Cases C-779/21 P and C-799/21 P | Commission and Council v Front Polisario). The CJEU set the criteria for implied consent. It said:

> 'First, the agreement in question must not give rise to an obligation for that people. Second, the agreement must provide that the people itself, which cannot be adequately represented by the population of the territory to which the right of that people to self-determination relates, receives a specific, tangible, substantial and verifiable benefit from the exploitation of that territory's natural resources which is proportional to the degree of that exploitation. That benefit must be accompanied by guarantees that that exploitation will be carried out under conditions consistent with the principle of sustainable development so as to ensure that non-renewable natural resources remain abundantly available and that renewable natural resources, such as fish stocks, are continuously replenished. Lastly, the agreement in question must also provide for a regular control mechanism enabling it to be verified whether the benefit granted to the people in question under that agreement is in fact received by that people.' (COMMISSION AND COUNCIL V FRONT POLISARIO, para 181).

As the production of green energy and green hydrogen means the use of land and water on a particular territory, it constitutes an exploitation of those natural resources. Therefore, if it is done on the territory of the Western Sahara, it has to be done with the consent of the Saharawi people. Otherwise, it constitutes a breach of international law and EU law. It is important to stress that, in our view, it is not only the EU and the Member States that are bound by these judgments, but

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also the EU-based companies This means that EU-based companies investing in projects in WS that are bound to exploit the natural resources of the Western Sahara violate EU law if they do not secure the explicit or implied consent of the people of the Western Sahara. The recent projects by European partners in the Western Sahara region thus run counter to this requirement and violates the principles of recognition justice for the Saharawi people.

Procedural Justice

Procedural justice has a strong dimension in the EU legal framework among others in the Treaty on the European Union (article 11) and the Aarhus Convention. Squintani and Schouten (2022) specifically wrote about public participation in the EU hydrogen Economy with a focus on Groningen. Article 11(1) of the TEU states that EU institutions will 'give citizens and representative associations the opportunity to make known and publicly exchange their views in all areas of Union action'. Macro-level decisions in policies, plans and programmes often limit the space for micro-decisions (specific decisions on permits and projects) even though people are more inclined to participate at the micro-level (Perlaviciute & Squintani, 2023; Gómez & Rehage 2024).

These legal requirements for public participation, however, do not necessarily translate to effective participation at the level of energy policy. The 2020 EU Hydrogen Strategy for instance did have a public participation procedure, however, this was only open for ten business days, which falls short of the reasonable timeframe required by the Aarhus Convention (Gómez & Rehage (2024)). The consultation received 279 comments, of which only 35 came from citizens. Squintani and Schouten (2022) also found 'shortcomings in the drafting and implementation of the regulatory framework on public participation as regards the development of a hydrogen economy at all levels of governance, from the EU to the local level.' Most of the important policy decisions such as the investments in the hydrogen economy and the organisation of infrastructure and storage were made at a macro-level without participation (Squintani & Schouten, 2022). At the project level too procedural justice concerns arose. Squintani and Schouten mention a storage facility project where the participatory plan explicitly mentioned that the location of the hydrogen storage location was not part of the participatory procedure (Squintani & Schouten, 2022). This lack of adequate participation was also noted by Rodhouse et al. (2024).

There are risks for procedural justice in Morocco based on the indicators for different dimensions of procedural justice. For example, Morocco has a transparency index of 11/20 (Mungiu-Pippidi, 2022), the world Press Freedom Index gives it a score of 48.04/100 (Reporters Without Borders, 2025). Also in terms of due process and corruption Morocco scores poorly with an Index of Public Integrity (which looks at the opportunities and constraints for corruption) score of 5.34/10 (Mungiu-Pippidi, 2022), a Fragile State Index (measuring the risk of social, political and economic conflicts, with higher scores indicating greater fragility) of 68.8/120 (The Fund for Peace, 2025) and a Rule of Law Index (measuring a range of justice related indicators including government constraints, corruption and fundamental rights) score of 0.48/10 (World Justice Project, 2025) leaving it below or just at the global average in many of these indexes. Besides the issues highlighted at the previous section, various sources point to the significant procedural justice problems in Western Sahara. In 2010, several thousand Saharawis established a Gdim Izik camp in the desert near El Aaiun to protest the social and economic exclusion (Western Sahara Resource Watch, 2017). The protest was violently dispersed by the Moroccan authorities, and the activists were illegally detained and sentenced to severe prison sentences, while many were tortured (United Nations Office of the High Commissioner for Human Rights, 2023). Another telling example of suppression of the freedom of expression is the illegal detention and harassment of Sultana Khaya, the president of an organization called "League for the Defense of

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Human Rights and Against the Plunder of Natural Resources" by the police (Amnesty International, 2021). Along with the exploitation of natural resources without their consent, these reports show that Saharawis' voice is suppressed even when they try to protest their exclusion. Even within Morocco, some sources report that the inclusion of the local community in decision-making related to green energy projects is limited to awareness campaigns (Yahyaoui, 2024). Even if the local community members were invited to public meetings, they received information in a language they did not understand (Haag, 2022). Sometimes, they were told straightforwardly that they had no choice but to accept the project (Haag, 2022). Finally, some other sources express concerns that the public participation of local communities was suppressed (Müller et al. 2022).

Main results

The analysis shows that whereas there are potential environmental benefits to a transition to a green hydrogen economy, EU and national policies insufficiently address the (risk of) injustices that arise in the production of green hydrogen. Risks of distributive injustices, in terms of access to energy and its affordability, and where the benefits are not shared with (energy poor) local communities and will largely flow to European based fossil energy companies, are present in both Groningen and the Western Sahara. However, these risks materialised differently in both cases. In Groningen distributional concerns around the high cost of energy and the financial viability of green hydrogen production take centre stage. Meanwhile in Morocco distribution justice concerns surround the access to water and energy, resource extraction, the distribution of financial risks and in the Western Sahara particularly colonial dynamics of land grabbing and exploitation (Müller et al., 2022; Tunn et al., 2024).

In terms of recognition justice, again similar risks of underrepresentation and misrecognition were shared between both case studies. In the Groningen case study particularly through insufficient effective participation in hydrogen projects and a lack of recognition of past injustices incurred during the gas drilling in the region (Rodhouse et al., 2024). These risks appear insufficiently addressed in the overarching EU regulation and governance structures for green hydrogen projects, while in the concrete projects under examination we find little evidence of acknowledgement and mitigation measures. Moreover, in terms of recognition justice we found that in particular in the Western Sahara, indigenous and land rights had not been recognized, and there seems to have been little to no recognition of the most vulnerable members of the community and plans were not properly including a breadth and diversity of voices.

In terms of procedural justice, public participation is ineffective in both the Netherlands and Morocco. In the Netherlands procedural risks centre around a lack of effective participation, with little room for participation by citizens. In Morocco, risks are present across all parts of procedure, from transparency and corruption to due process. These risks were further exacerbated due to poor indicators in terms of procedural justice with low scores and risks associated to little transparency, corruption, poor public participation and obstructed civil society. While Morocco scores poorly on many of the indicators for transparency and due process, the situation is particularly critical for the Western Sahara, where the protection of indigenous rights seem far from secured and democratic processes insufficiently give voice to these actors (Müller, 2022).

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Discussion and conclusions

The findings show that there may be a blind spot in EU law and policy on the hydrogen transition regarding the justice consequences of such policies. Whereas the EU targets for renewable hydrogen uptake have pushed Member States towards supporting green hydrogen production and demand creation, EU policy has focused too much on the abstract and aggregate economic and CO2-related costs and benefits of this transition. The social (and in particular the justice) dimension of this transition has received little to no attention in EU policy. Significant additional concerns emerge once one integrates (energy) justice concerns along the lines of distributional justice, recognition justice and procedural justice in risk and impact assessments. Both in terms of the domestic effects of the policy proposals and in their international context, little attention is paid to the injustices that accompany the hydrogen transition. The review shows that these risks are substantial. In terms of distribution, established fossil corporations are gaining large public investments to realise the EU hydrogen economy in energy-poor regions. The benefits and costs of this transition are largely skewed in favour of business interests as opposed to public finances and local communities. This distributional issue is further exacerbated by the lack of public participation in both areas and the lack of recognition of local voices and indigenous rights. The EU's policy on achieving a green hydrogen economy has thus become part of colonial dynamics and land grabbing in Northern Africa. Taking a life cycle perspective, however, highlights further risks of negative environmental and social effects, particularly in respect of the critical raw materials required to build electrolyser facilities. Many of these materials and components are sourced in China, India and South Africa where the production causes a range of social and environmental harms (dos Reis et al., 2024; Werker et al., 2019). These impacts should not be left outside of the scope of EU action, as is currently often the case.

In terms of recognition justice, the case study has made clear that there is insufficient recognition of marginalised and vulnerable groups inside of the Union and outside. Within the Union we can see how higher-level policy approaches restrict and narrow participation by the public at the micro scale, often through inadequate response deadlines and based on a presumed lack of technological or scientific knowledge of sustainability transitions. These technocratic ways in which the transition is approached not only misrecognises public knowledge and views, but they also ignore relevant and legitimate concerns surrounding distributive and procedural justice. The lack of adequate attention to dimensions of representation and recognition further exacerbate this. Outside of the Union we see how Union policies carry on colonial legacies of exploitation, resource extraction and human rights violations. This is apparent in the case of the Western Sahara, where European companies extract natural resources on occupied territory, legitimising and entrenching colonial appropriation of the Western Sahara by Morocco.

There were several gaps in the data. First, there is almost no data on many of the indicators used for the Western Sahara, this means that it is hard to quantify the situation on the ground. Second, we lacked access to the specific agreements that are set up by private and government institutions to realise the green hydrogen economy. These contracts and agreements would allow for further scrutiny of the distributional consequences of hydrogen projects, in particular which parties carry the financial risks, and which parties stand to profit. Third, there is a lack of publicly available impact assessments of existing hydrogen production sites and infrastructure, access to such information would have made the existing analysis much more detailed. Future research should seek ways in which these justice dimensions can be integrated in EU and national policymaking, including ways in which the availability of relevant information can be secured. The literature on environmental justice in general and energy justice in particular can be a good starting point for such an anchoring.

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Recommendations

In terms of recommendations that flow from the case study we will present these along the same three justice dimensions that were used in the case study:

In terms of distributive justice, what is clear from the two cases is that local communities and society more broadly do not benefit directly from projects in the green hydrogen economy. EU, national and local policies should seek to distribute the benefits from these transitions more broadly, allowing for (financial and ownership) participation in green hydrogen projects. This could be achieved either through public investment in green energy and hydrogen that allows for access to renewable energy and a reduction in energy poverty or through community benefit agreements that share the wealth created by large scale energy projects. Moreover, more action is needed to prevent human rights and environmental degradation along the value chain, with large risks of complicity of human rights abuses in Morocco and elsewhere.

In terms of recognition justice, EU procedures for participation and impact assessment should focus more on integrating perspectives of vulnerable groups and communities. More weight needs to be given to vulnerable groups that are especially affected by energy policies, possibly even within the framework of the Aarhus Convention (Squintani & Schouten, 2024). In its external policy, the EU misrecognises or even ignores the risks for indigenous rights of the Sahrawi people in Morocco. The recent trade agreement with Morocco further amplifies this picture, where the Commission has in secret negotiated a new FTA with Morocco with no influence from the Sahrawi peoples (Pelliconi & Von Massow, 2025). In terms of procedural justice, there are important concerns in cooperating with Morocco, especially in the Western Sahara. Future cooperations need strong rule of law integration and requires an increase in transparency. Moreover, formal consent from the Sahrawi people is necessary. As for the EU, in terms of public participation the literature has some clear suggestions for improvement:

‘It is important that the Aarhus Convention requirements on public participation are applied in full, at all levels of government, including in case of plans and programmes from semi-public bodies. Macro-level policy options can then be subject to public participation when they are drafted and thus easy to change, rather than when they are implemented at project level, often by different parties than those who can shape macro-level policy options. Finally, the visibility of the duty of public participation in the context of the development of the hydrogen economy would benefit from a clearer framework on public participation at EU level.’ (Squintani & Schouten, 2024, p. 170)

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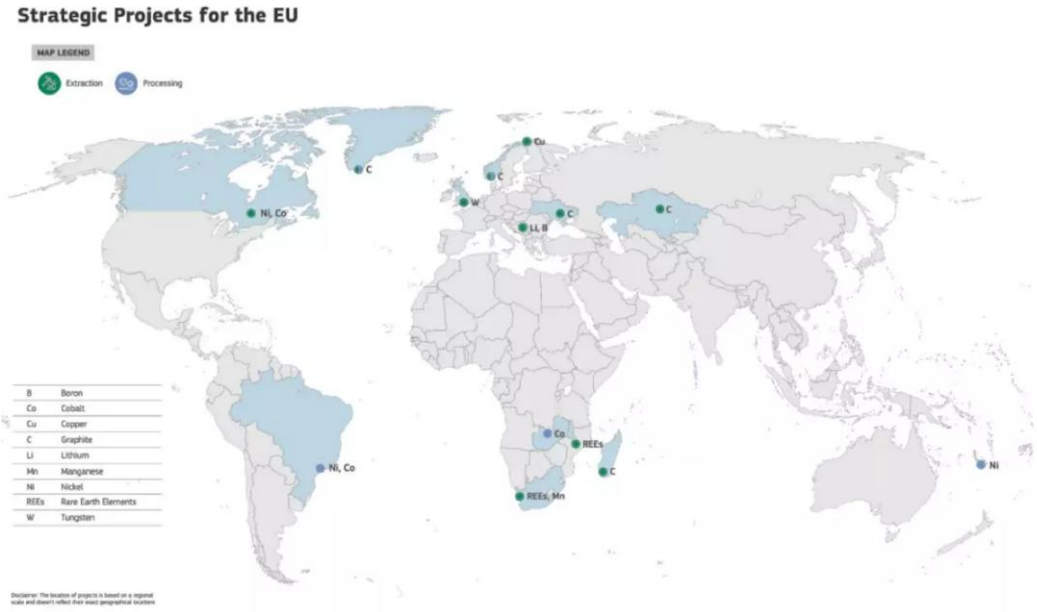
1.12 Case study 12: Mining Lithium in Serbia

Overview

The Jadar case study offers a comprehensive exploration of one of the most polarising development projects in Serbia today, shedding light on how top-down green transition agendas intersect with local realities. Conducted as part of the GreenPaths project, the research aims to illustrate the complexity of transition processes that claim to be "just," but are often experienced quite differently by affected communities. By focusing on the proposed lithium mine in the Jadar Valley, the study examines the multidimensional impacts of the project, encompassing environmental, social, economic, political, across both local and national levels.

While the project is named as one of the Strategic Project in third countries under the Critical Raw Materials Act (CRMA) by the European Commission (EC, 2025) and it is framed as a strategic opportunity to increase European lithium production and reduce carbon emissions aligned with the EU's Green Deal Fit for 55 targets and Batteries Regulation 2023/1542, the research reveals significant tensions surrounding its legitimacy, purpose, and long-term value for Serbia. With 34.8% of land in the City of Loznica classified as agricultural (Statistical Office of the Republic of Serbia, 2013) and 38.2% of its residents at risk of poverty or social exclusion, the stakes are particularly high. Despite being a non-EU country, Serbia has entered into a Memorandum of Understanding (MoU) with the EU to cooperate on critical raw materials, lithium foremost among them, raising its geopolitical importance while also exposing it to extractive pressures. However, the domestic share of renewable energy in transport remains just 0.6% (Eurostat, 2023), which has led to public scepticism about whether lithium extraction serves local transition needs or simply fulfils external (EU) demands.

Figure 18. Global map selected strategic projects under CRMA, critical raw material projects located in third countries and in overseas countries or territories as Strategic Projects under Regulation (EU) 2024/1252 of the European Parliament and of the Council



Source: EU Commission 2025

The study applies discourse analysis to understand how competing narratives, including government, corporate, civil society, but also EU, frame the project and how these frames shape

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public perception, policy decisions, and protest mobilisations. Our analysis engages the concept of Loss and Damage (United Nations Framework Convention on Climate Change [UNFCCC], n.d.) to examine harms that are difficult to quantify yet are deeply felt: cultural loss, social fragmentation, destruction of landscapes, and erosion of democratic processes. While economic risks have been widely debated (Šoškić et al, 2024; Stručnjaci GOVORE, 2024), this research foregrounds non-economic losses such as the transformation of land-based livelihoods, severing of intergenerational ties to farming, and the irreversible alteration of local ecosystems, including areas where 145 protected species have been recorded (Ministry of Environmental Protection, 2022), as well as heritage sites like the Paulje necropolis, one of the biggest central Balkans cemeteries from the bronze age that is potentially at risk, as company is planning mining waste site close to this location (Marš sa Drine, 2025).

The Jadar case demonstrates how the opening of a mine not only threatens biodiversity and farmland, but can also trigger social rifts and political demobilisation. The case study highlights how communities are divided between those who resist and those who yield, often under pressure. The fear of becoming "collaborators" among neighbours, or being left without options for relocation, deepens social fractures. Nationally, the project has galvanised some of the largest environmental protests in Serbia's recent history. However, should the project be revived, it could set a precedent that discourages future activism and undermines local conservation victories, such as the successful resistance to small hydropower plants in the region of Old Mountain (Energetski portal, 2020).

Although the scholarly literature on the Jadar project and lithium extraction in Serbia is still emerging, several important contributions already outline its environmental, political, and governance dimensions. Đukanović (2022) documents local experiences of uncertainty, mistrust, and community fragmentation, foregrounding the social dynamics of extractivism; Šoškić et al. (2024) offer a macroeconomic critique that challenges state and corporate claims of national benefit; while Ivanović et al. (2023) and Ristić et al. (2024) analyse technical, hydrological, and ecological risks associated with proposed mining technologies and waste disposal. Additional work by Krizmanic et al. (2024) highlights biodiversity vulnerability and the limitations of official assessments, whereas Šterić (2023) provides a discourse-focused account of how competing political actors frame the project. Many of these scientific analyses have been brought together in a comprehensive publication of the Serbian Academy of Sciences and Arts (SANU), which dedicated a special volume to the Jadar project, consolidating expert findings (Stevanović, Šolaja, Radmilović, 2024). Together, these studies identify important environmental justice and governance concerns, yet they offer only partial insight into the non-economic, anticipatory, and socially embedded harms generated by the project. What remains underdeveloped are analyses that conceptualise these harms through a Loss and Damage framework (UNFCCC, n.d.), and that situate Serbia's lithium politics within its semi-peripheral position, EU accession dynamics, and the geopolitical pressures of the green transition. This case study directly addresses this gap by integrating discourse analysis with Loss and Damage to capture intangible impacts that existing studies acknowledge but do not systematically examine.

In this context, the Jadar case becomes emblematic of a deeper dilemma facing semi-peripheral countries: how to engage with global green agendas without becoming sacrifice zones for distant goals. It contributes to the GreenPaths project by documenting not just the discourses of transition, but also its lived consequences, reminding us that justice in transition is not a given, but a terrain of struggle.

Research questions

Case Study Research Question:

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- How are decarbonisation and energy transition EU policies impacting policies, narratives and discourses, around Jadar lithium project in Serbia?

Empirical questions:

- What is the estimated environmental, social, cultural and economic impact of the Jadar lithium project in Serbia?
- What is the response from the local communities regarding this project - current and historic overview?
- How are the discourses on decarbonisation and energy transition stemming from EU policies shaping positions of main institutional stakeholders?
- How do political discourses by the EU, Serbian government, and opposition parties around the Jadar lithium project reflect the tensions between decarbonisation goals and new extractivism in the context of Serbia's EU integration?

The research is grounded in the theoretical framework of Loss and Damage (UNFCCC, n.d.), allowing for a multidimensional understanding of both material and non-material harms, such as environmental degradation, biodiversity loss, forced displacement, cultural erosion, and the erosion of democratic processes, that may result from green transition projects in semi-peripheral regions.

Methods

This case study applies a qualitative methodology combining discourse analysis with a review of diverse secondary sources to explore how EU decarbonisation and energy transition policies influence political, institutional, and social narratives surrounding the Jadar lithium project in Serbia.

Given that the Jadar project has not yet been implemented, many of its environmental and social consequences remain in the domain of projections; the analysis relies on publicly available documents and narratives. These include policy documents, media statements, investigative journalism, reports from civil society organisations, and corporate communications, covering the period from September 2021 to October 10th, 2024, a timeframe selected due to key developments such as the first mass protests in autumn 2021, the authorities' declarative revocation of the project, the signing of the Serbia–EU lithium mining agreement, and the largest protest held in August 2024. Special emphasis was placed on recent news articles and in-depth journalistic features, which proved essential in capturing the evolving socio-political climate around the project, local resistance, and public sentiment. This approach helps fill the gap left by the limited number of peer-reviewed academic studies on this topic, though this body of work is steadily growing and already spans diverse themes, including environmental justice, political ecology, governance, and strategic resource extraction.

Discourse analysis was used to examine how key actors construct and contest meaning around the Jadar project. We analyzed statements by European Union representatives, Serbian government officials, the Rio Tinto company, as well as civil society groups, local activists, and members of the affected communities. This follows and expands on similar previous work by authors such as Šterić (2023), providing continuity in examining the discursive field around the project.

Rather than limiting the analysis to formal political actors, the study also incorporates broader societal narratives, especially those voiced by citizens through protests, petitions, and public forums. These narratives often invoke non-economic dimensions of harm, which are typically marginalized in official risk assessments. By analysing these narratives through the lens of Loss

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and Damage, the research brings attention to the lived realities and anticipatory fears of local populations.

The analysis follows key thematic concepts aligned with the GreenPaths project, focusing on how decarbonisation and energy transition policies generate specific local, sectoral, and systemic dynamics. At the project level, the study traces the effects of the Jadar mine on local communities and ecosystems, emphasising lived experiences, social cohesion, and environmental concerns, as expressed in the aforementioned sources. At the sectoral level, it explores how Serbia's lithium resources are framed within global renewable energy and battery supply chains, revealing dynamics of resource dependency and integration into low-carbon markets. At the case level, it is situated within broader geopolitical and economic trends of new extractivism and green industrialisation on the semi-periphery, particularly in the context of Serbia's EU accession process. This layered lens allows for a nuanced exploration of the distributive, procedural, and recognitional dimensions of environmental justice that underpin the GreenPaths research agenda.

Findings and Results

This case study examines the controversial Jadar lithium mining project in Western Serbia, led by the multinational corporation Rio Tinto. Defined as a critical raw material, necessary for the EU's green transition process, lithium extraction in Serbia has become a flashpoint for debates over environmental justice, national sovereignty, and the EU's approach to sustainability.

Following the political and economic post-socialist collapse of the 1990s, Serbia entered a period of privatisation and economic development based on foreign direct investment. During this time, Rio Tinto began exploring mineral deposits, aided by Serbian geological data gathered during the era of public ownership. In 2004, a lithium-boron mineral called Jadarite was discovered near Loznica. "At the time it made global news for a very different reason, it was concluded that it has a chemical composition which is almost identical to the fictional kryptonite from the Superman franchise, but its real usage became evident many years later" (Djukanovic, 2025). The International Mineralogical Association officially recognised it in 2006 (Gautneb et al. 2019).

Rio Tinto claims to have invested over $450 million in research (Paul, Tan, and Menon, 2022), planning to extract lithium carbonate, boric acid, and sodium sulfate from the site. These materials are critical for the green and digital transition, and lithium is listed as a strategic and critical raw material in the CRMA (2024) important for battery production (EC, 2023). However, the planned project has been mired in controversy since its announcement.

From 2019 onward, the Jadar project faced growing opposition from scientists, experts, local communities, and civil society groups (Balkan Green Energy News, 2024). Critics raised concerns about environmental degradation, groundwater contamination, and violations of legal procedures during the exploration phase. The local movement "Ne damo Jadar" (We are not giving Jadar) and the national Alliance of Environmental Organisations (SEOS) became the symbol of resistance, emphasising the rights of communities over extractivist development.

By early 2022, mass protests had spread across Serbia, including highway blockades and widespread civil disobedience. The public backlash forced the Serbian government to revoke Rio Tinto's licenses and formally halt the project. In early April 2022, the Alliance of Environmental Organisations of Serbia and the Kreni-Promeni movement submitted a People's Initiative to the National Assembly, which proposed the Law on Permanent Prohibition of Exploration of Mining of Boron and Lithium in the entire territory of the Republic of Serbia, containing more than 38000 signatures (Vujasin, 2022). It took more than two years for this initiative to be discussed in the Parliament, where it was rejected by the ruling majority (Todorović, 2024). Over 300,000 people had signed a petition against the mine, about 5% of Serbia's population (KreniPromeni, n.d.).

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It became clear that the lithium exploitation project was back in full force in July 2024 when the Constitutional Court overturned the Serbian government's decision to halt the Jadar project, stating that it was "not by the Constitution and the law" (Reuters, 2024). Days after that, a non-binding Memorandum of Understanding was signed between Serbia and the EU (EC,Government of the Republic of Serbia, 2023) to forge closer cooperation in the areas of sustainable raw materials, battery production chains, and electric vehicles (EVs). Reacting to these change of decisions, and signing of the MoU, a local activist organisation organised a big protest in Belgrade, which gathered more than 50,000 people, making it one of the biggest protests in last few decades in Belgrade, which ended with blockades of the highway and main railway stations (DW, 2024).

One of the reasons for public opposition to this project lies in various uncertainties surrounding it. Citizens and academics and experts opposing the project frequently emphasise that it is unclear how the project will be implemented and that both the company and authorities often make claims that cannot be verified through available documentation (Stevanović, Šolaja, and Radmilović, 2024). Moreover, Rio Tinto lacks experience with the technologies and methods planned for the extraction and processing of lithium from jadarite ore, which further increases distrust in the process (Ivanović et al., 2023). Additionally, drawing from the example of environmental devastation around Zijin's copper mines in eastern Serbia near the cities of Bor and Majdanpek, where authorities appear to be doing little to protect local residents from foreign interests, people in the Jadar region fear they may become yet another sacrifice zone (Đukanović, 2022). To provide context for the conditions in which this project is being proposed, it is important to note that Serbia is one of the countries with the highest levels of income inequality (Eurostat 2022), corruption (Trading Economic 2022), and the lowest levels of political and media freedom in Europe (Freedom House 2025).

The potential social, economic, and environmental impacts of lithium mining in Serbia are causing significant divisions within society. On one side are Rio Tinto and pro-lithium mining representatives of the national and local governments, who claim the project will substantially contribute to the economic development of western Serbia and improve the quality of life for local communities (Todorović, 2024). On the other side are primarily the local residents, who view the project with deep concern, as well as a broader public who fear that the area around the city of Loznica will become a sacrifice zone, leading only to environmental destruction and displacement of local people (Đukanović, 2022).

In 2020, a Spatial Plan for a Special Purpose Area (Ministarstvo građevinarstva, saobraćaja i infrastrukture, 2020) was published for the implementation of the Jadar jadarite mineral exploitation and processing project. The plan was prepared by the Ministry of Construction, Transport and Infrastructure, at the request of "Rio Sava Exploration d.o.o. Belgrade." The spatial plan area covers 293.91 km², including 22 statistical settlements within the territory of the city of Loznica and the municipality of Krupanj in western Serbia. It covers 34.2% of the territory of city of Loznica, and 32.0% of the planned area consists of agricultural land. The agricultural income of 10 villages in and around the Jadar valley is estimated at around 82 million euros per year (Statistical Office of the Republic of Serbia, 2020), a benefit much higher than the potential profit from the ore rent, which is estimated to be less than 40 million euros per year (Šoškić, Popović, Mijatović, and Drakulić, 2024).

According to the 2011 Census, 19,697 people live in the 22 settlements covered by the Spatial Plan (Ministarstvo građevinarstva, saobraćaja i infrastrukture, 2020). The Plan also states that the economic structure of this area is characterised by a dominance of agricultural activity and industry, along with relatively developed sectors such as tourism, hospitality, and trade.

Since the area where the mine is planned is rich in fertile land and many people engage in agriculture, the primary concern of the local population is the risk of pollution and destruction of farmland. Moreover, both locally and nationally, citizens and experts opposing the lithium mining

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project often argue that fertile land must not be sacrificed for mining. As they say, "fertile land can be turned into a mine, but a mine can never be turned back into farmland" (Đukanović, 2022). This concern is also fueled by the fact that during the exploration phase in the Jadar River region, toxic substances were leaked from exploratory drill holes, leading to the destruction of nearby crops and the death of animals (Đorđević et al., 2024). In the research which focuses on the effects of the project on the local population, it is evident that citizens interviewed expressed deep concern for the future of the Jadar region and their own livelihoods (Đukanović, 2022). They also felt deceived, as prior to the publication of the Spatial Plan, local residents had been assured by the company that the scope of the project would be significantly smaller.

As one of the locals from the Jadar valley stated: "*They [locals of the Jadar Valley] had no idea what was to come. They were slowly cooked like a frog, they [the Rio Tinto employees] infiltrated the society, donated to schools, came into their houses to visit, for Slavas9 and so on. They were convincing locals that it is a very small area in question, and they presented the project in a completely different way.*" (Đukanović, 2022).

Moreover, it was noted that company employees had spent years developing friendly and close relationships with the local population, which only deepened the distrust once the full extent of the project was revealed. Further distrust stemmed from the company's purchase of properties in the Jadar valley, within the area where the mine is planned, and reports of intense pressure placed on those who refused to sell their land. After purchasing the properties, Rio Tinto reportedly began dismantling houses, removing roofs and destroying other household elements, which was seen as an indirect tactic to intimidate and discourage those still resisting the sale of their land (Latković, 2023).

In contrast to the concerns of local residents, Rio Tinto and government officials maintain that the project will bring economic and social development to the region. For years, Rio Tinto has been running financial support programs (Rio Tinto Serbia, n.d.), offering donations to various cultural, sports, agricultural, and community organisations and events. Government representatives and public institutions have also emphasised the economic benefits of the project, portraying it as Serbia's greatest development opportunity by linking lithium to the oil discovery that transformed Norway's economy (Politika, 2024). Key political figures, including the President, the former Prime Minister (now Speaker of Parliament), and the Minister of Mining and Energy, have promoted the project as a once-in-a-lifetime chance for Serbia and especially for the Jadar region.

According to the only available economic study on the project, published by the Rio Tinto (Ergo Strategy Group, 2023), the Jadar mine is expected to create over 1,300 permanent jobs throughout its operational period, for which is still uncertain when the operation would start, but it is predicted to last for around 40 years (Rio Tinto Srbija, n.d.), along with 3,500 temporary jobs during the construction of the processing plant. It is claimed that the city of Loznica will receive €25 million annually from taxes, and that Serbia would earn €696 million in total over the mine's 40-year lifespan.

However, in a critical analysis published by economists and professors from the University of Belgrade (Šoškić et al, 2024), it is argued that Serbia's projected income - €696 million over 40 years, or just €17.4 million annually - is overstated, especially when considering that it does not account for the state's infrastructure costs to enable the project. Notably, the Jadar project is reportedly the only Rio Tinto project in the world where the host country is responsible for covering all road, railway, and supporting infrastructure expenses. In addition, Serbia would not hold any ownership stake in the project, meaning it relinquishes full control over its mineral resources. Meanwhile, in the event of environmental disasters, such as flooding, Serbia would bear the cost of damage mitigation (Šoškić, et al, 2024). The government also plans to issue large subsidies for the construction of an electric battery factory by a company that, notably, lacks experience in mass production of such technologies. Altogether, these circumstances suggest that

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the project could cost Serbia more than it delivers in benefits. Experts concluded that the planned activities, especially the disposal of industrial waste, would cause significant harm to biodiversity in the entire area of operation.

Environmental damage is among the public's greatest concerns regarding the Rio Tinto project and lithium mining in Serbia. The environmental impact assessment (EIA) was not made available to the public until mid-2024, when the company released a draft version (Balkan Green Energy News, 2024). While company representatives and government officials claim the mining will be done in line with the highest environmental standards, local residents and members of the scientific community remain sceptical.

Numerous academics expressed concern around the project which culminated in a special conference with the findings presented and later published (Stevanović et al., 2024). For example, (Ristić et al. 2024) noted that constructing a waste disposal site in the Štavica stream basin could disrupt the area's hydrological and sediment regimes and degrade its biological diversity. Furthermore, implementing this aspect of the project would require the removal of 2,600 cubic meters of forest biomass. Professors and researchers from the Faculty of Biology at the University of Belgrade, who were responsible for biodiversity studies in the Jadar valley, concluded that over 30% of registered habitat types in the area fall into priority conservation categories (Krizmanić et al., 2024). They warned that if the jadarite exploitation project proceeds, it will result in numerous negative impacts, many of which will be irreversible or only partially reversible for the area's ecosystems. The final recommendation of the above-mentioned conference was clear: the only effective measure to prevent the destruction of biodiversity is to abandon the planned exploitation and processing of jadarite.

Additional field research done by Đorđević et al. (2024), confirmed that during the exploratory phase, toxic water leaked from drill holes. Traces of arsenic, boron, and lithium were detected in groundwater, surrounding soil, and in the Jadar River's flow up to 20 km downstream from the test sites. Given that the planned mine is located in a region heavily reliant on agriculture, these findings have heightened concern, especially in light of the Serbian government's recent legal changes that increased permissible levels of arsenic and boron in soil (Đorđević et al., 2024).

In statements addressed to the Ministry of Mining and Infrastructure and the Ministry of Environmental Protection, representatives of the Serbian Academy of Sciences and Arts concluded, after reviewing presentations and available documents, that the Jadar Project lacks sufficient transparency and clarity (Stevanović, Šolaja, and Radmilović, 2024). They emphasised that there is not enough information available to determine either the profitability of the project or its ultimate environmental impact.

Discourse analysis on Jadar Project: EU, Government and Opposition

We have undertaken discourse analysis of public statements from official political actors: EU officials, representatives of the ruling coalition in Serbia, and opposition party representatives. Discourse analysis treats public statements as social products; therefore, it focuses on which strategic goals are being pursued in the discourse and ways the abovementioned actors position themselves in alliance or in contrast based on the relevant audiences they are addressing.

The time frame analysed spans from September 2021 until October 10th, 2024. This period is taken due to major events starting with first massive protests in the autumn of 2021, declarative revocation of the project by authorities, Serbia and the EU signing lithium mining agreement and the most visited protest in August 2024, sparked by the public launching of the Rio Tinto project by the government after they convincingly won the repeated Belgrade, and regular municipal elections in June 2024, while first Belgrade elections and parliamentary elections were held in December 2023. On October 10th, the Serbian Parliament rejected the bill submitted by 86 MPs

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to the Law on Mining and Geological Explorations that would ban exploration, mining, and processing of lithium and boron.

EU officials

EU officials consider three target groups while positioning themselves on the Jadar Project: EU member states and institutions, the Serbian government and its citizens, and Environmental groups.

The EU Ambassador to Serbia, Emanuel Gioffre's stance from 2021 that *if* the project is to be realised, strict environmental standards need to be imposed (Beta, 2021). On the contrary, a succinct message was sent when the EC opened negotiation cluster no. 4 "Green Agenda and Sustainable Connectivity" at the peak of the anti-lithium mining protests in December 2021 (Government of Serbia, 2021):

Officials are direct when it comes to linking the dependency of Serbia's EU candidacy status and lithium mining while putting economic prosperity of Serbia in the spotlight: Sefcovic, EU commission Vice President in charge of the "EGD": *EU candidate Serbia could be the first European country to command the whole chain needed to manufacture EVs, which starts with lithium mining* (Reuters, 2019). Further, he explicitly added that EC wants Serbia in the EU as soon as possible and that the Jadar project will only speed up the process (N1 Beograd, 2024), thereby directly linking Serbia's EU accession with its implementation of the Jadar Project.

While the Serbian government attempts to assure its citizens of highest world ecology standards by referring to EU regulations or just the "Germans", the EC clearly addresses it is the responsibility of institutions in Serbia (Vreme, 2024), with the sole responsibility of the "project organisers" to submit a report on the status of the project every two years, framing the Jadar project in the same terms as any other potentially strategic operation that can be stopped even if declared strategic by the EC. On the other hand, the German chancellor supported president Aleksandar Vucic when jointly signing the MoU (EU and Serbia, 2024), noting that the project can only work if there is *"compliance with the highest standards of environmental protection, and Germany will help in this*" (Radio Free Europe, 2024) stretching further to present his effort and determination when presenting that he has talked to the head of Rio Tinto (Reuters, 2024).

EU officials are trying to adapt to widespread discontent and demonstrate awareness of public sentiment regarding the Project. For example, Franziska Bratner, member of the ruling Greens and State Secretary at the German Ministry of the Economy (Spasić, 2024), claims that the EU not only acknowledges resistance, it recognises that the resistance was justified and the EU has shown its democratic virtue and patron role by reacting to it and "calling for a change in concept". This statement obliterates all previous ignorance of mass protests, as officials were sensing the magnitude of the project's opposition. Therefore, this narrative appeared 3 days after the protest in Belgrade with c.50.000 people, rating it among the 10 most populous public assemblies in Serbia (Arhiv javnih skupova, 2024). Along with evaluating protests as legitimate, Branter directs recommendations that could be understood as threats: *"It's not a question of 'whether the project will happen', but 'whether Rio Tinto's project will be carried out with European partners or the Chinese'. I don't believe a Chinese-Serbian partnership would be better for democracy, the environment, and the local population"*(Spasić, 2024), implying Serbia's dependency on foreign direct investments and probably referring to existing mines operated by Chinese companies.

This way, the EU is positioning itself primarily as a benevolent supervisor of Serbia's economic progress and EU candidacy. As if to say, 'we will intervene when you drift away from the desired path, but you are alone on that path, and remember it is surely the best one for you'.

A critical voice strongly standing out among EU officials is that of Thomas Waitz, a member of the European Parliament and co-chair of the European Greens. "*Let's not repeat the mistakes of*

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the past, when the hunt for key resources for energy led to pollution and the undermining of societies", positioning the project within the wider issue of mining companies exploiting countries with weaker environmental regulations (European Greens, 2024).

To conclude, besides a few dissonant voices, the EU appears unified in its narrative and actions (e.g. visiting delegations) regarding the Jadar project. Framing it as part of the EGD and efforts to decarbonise the continent, the EU insists on greater progress for Serbia's economy and its path towards EU membership (Živanović, 2021). While Serbia's responsibility for the course of the project is presented autonomous and critical for national sovereignty, Europe simultaneously presents itself as a guarantor of ecological standards and fair working conditions (EBA250, 2021). When asked to more precisely formulate its jurisdictions on the course of the project, the EU suddenly becomes an expert consultant that monitors the situation and provides assistance while control of the project is in "protege's" hands.

Government of Serbia

Government representatives have homogeneously stood in favour of the Jadar Project (Government of Serbia, 2020) and its overarching potential: *"I expect that a full chain of added value will be established in cooperation with the state, not only for the Mačva district and the city of Loznica but for the whole of Serbia"* (Office of the President of the Republic of Serbia, 2021), until it was declaratively revoked in January 2022 (Balkan Green Energy News, 2024; Government of Serbia, 2022). Before the creation of a general negative stance, the project was part of the narrative of successful attractions of foreign direct investments (FDI), which is implicitly represented as the best and only economic development model for Serbia (Ralev, 2022). With the explosion of protests, this just transformed into a more cautious support that emphasised care for the highest environmental standards (Serbia Business, 2021) to be implemented, whilst the overriding economic benefit for the country necessitated the Project as a big developmental opportunity in the global competition of energy transition. After the formal revocation of the project, the government, led by President Vucic, demonstrated continued support for the project in the form of grief for a huge, missed opportunity (Tatalović, 2024). In line with the need for economic development, the project was presented as important for the population's survival, as the Prime Minister argued that an even economic development in Serbia was a prerequisite for reversing the trend of depopulation (Jelovac, 2021). The Jadar project was presented not only as a promising mine, but a chance that would potentially enable Serbia to control (part) the value chain of the production (B92, 2021), implicitly contrasting it with other FDIs where final products are assembled in the investor's country of origin, where most of the profits are reaped.

With the outbreak of local and national resistance, officials became aware that they are not trusted at all, and subsequently made attempts to draw legitimacy from insisting on the highest global and EU standards, while national laws tagged along with them as a necessary garnish (Balkan Green Energy News, 2024).

In the period before the parliamentary elections of 2022, officials had several strategies to position themselves as the protectors of the national interest in contrast to the opposition, presenting them as "grabbers" who were politically benefiting from the resisting the Project on the backs of the people (Kurir, 2021). Along with accusing the opposition of "scavenging" on the topic for its increased public profile, another form of delegitimising their request included characterising them as "*paid from abroad to brainwash the local population about the project*" (Danas, 2021). Another narrative was that the resistance is organised by a competitor company that would take over the project (Radio Free Europe, 2021). These narratives are placed so they can work individually, but are broad and fluid enough that they do not necessarily contradict each other and therefore, can also work together in the form of sketches for various conspiracy theories.

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As the protectors of the national interest with democracy as one of the core values, officials insisted on the government's transparency and the need for citizens to have all the information before making a decision. This represented an introduction to the topic of a referendum, *"whether at the municipal or district level"*, which was one of the alternative plans to legitimately confront the resistance (Radio Free Europe, 2021).

Another strategy aimed to present the government as responsible implementers of contracts made by the previous governments with the current government painting themselves as victims that are fighting to repair the economic damage and criminality left by the former governments (Radio Free Europe, 2021; RTV, 2022).

After the revocation of the spatial plan in January 2022, official statements seemed largely focused on missed opportunities, mistakes and regrets (Danas, 2022) for bowing to the pressure of the protests, led by foreign political actors (Politika, 2023)*: "The ringleaders received the money and destroyed the country together with us who were stupid and naive to accept this impudence and this 'force' that thought it could do anything and I bitterly regret it*"(N1, 2022). The new Minister of Mining and Energy emphasised that Serbia is rich in some minerals on the EU critical raw materials list and noted that economies such as France, Germany, and Italy are preparing for decarbonisation through new industries (Politika, 2023). According to the Minister, certain environmental damage of the mine is the necessary cost of exploitation (Insajder TV, 2023), which represents a shift in the discourse since the government felt their position was strengthened; previously, environmental damage was never discussed without sugarcoating it with promises of significant economic development.

As noted above, the next crucial event was the overruling of the project stoppage by the Constitutional Court (Reuters, 2024) and the signing of the MoU between Serbia and the EU. Addressing environmental concerns in light of explicit support from the EU partners, Vučić (2024) insisted that the project will not commence without guarantees from European partners: *"Until the Germans guarantee us that we will have clean rivers and mountains, that we will also have the disposal for the landfill done in accordance with all European standards, we will not even try to start.*"(Vreme, 2024). Finally the president also invited the scientific community to participate in discussions about the project, emphasising transparency and the importance of scientific input in decision-making, albeit it a much later stage in the project's discussion (Government of Serbia, 2024) .

The rare examples of a critical tone coming from the ruling regime appeared in relation to the delay of the project, referring to allegations of Rio Tinto's arrogance as reflected in the lack of public communication with the media and local community (Politika, 2024). This was an attempt to appease some government supporters and appearing as powerful in relation to the investor, whilst simultaneously distracting from concrete environmental concerns, a lack of transparency, and reported pressure on local citizens (Balkan Insight, 2022). This shift in rhetoric came just before the 2024 mass protest in Belgrade, after which the President suddenly declares a new, negative stance on Rio Tinto, claiming that he will personally remain most suspicious in the case the government decides to approve the project (Danas, 2024). Again, we have a demonstration of centralised power by presenting the institutions as a one man band, combined with brief skepticism about the project meant to prevent potential rebellion among the "swing" public in the critical period.

When considering key audiences of state officials, we can divide them into: citizens of Serbia that are either supporting the mine or are "neutral" regarding to it. Secondly, the project has majoritarian support coming from EU institutions, therefore the current government must create an image of a stable, consistent actor able to realise Strategic Projects for the EU. The inconsistencies in the government's narrative regarding partners from the West and the future of the project (N1 Belgrade, 2024) seem to be allowed without major reactions from the EU (RFE/RL, 2024). These inconsistencies serve the purpose of the government in portraying itself

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as democratic with (temporary) stoppage of the project and as a sovereign protector by defending its citizens from foreign interest. The possibility of the dialogue in his discourse is terminated, as opponents to the project become enemies by default. When addressing opponents as traitors and actors financed by outside interest groups (KoSSev, 2024), the state is addressing the rest of the population. Along with continuous portrayal of the project as a crucial development chance that will advance Serbia, Vucic positions himself as a sincere protector of national interest, resisting internal and external attacks (Danas, 2024). This fits into a wider narrative that is applied generally, where Vucic identifies himself as David while all the opposing actors can – interchangeably or together– embody Goliath (Vasovic, 2021).

Opposition parties

Opposition parties were somewhat united in their stances regarding lithium mining, and with Rio Tinto project as its main representative, they were opposed to it, with views ranging on a spectrum of introducing a moratorium on lithium mining for 20 years in the Jadar Valley (Balkan Insight, 2024), which was primarily introduced by local ecological organizations formed by agricultural workers (Reuters, 2022), to the stances where lithium exploitation is not something that should be denied prima facie (Insajder, 2024). This anticipates some of the following preconditions to be met before any project could be considered: an unbiased ecological assessment study; technology for the excavation and processing of the lithium is globally improved; and the rule of law that guarantees high environmental standards are imposed in Serbia (Euronews, 2023; Danas, 2023).

The pro-European representatives have been talking about the pressure of (Western) foreign actors when it comes to lithium mining, in the period before the presidential and parliamentary elections in 2022 (Nova.rs 2021; Novosti, 2021): *"I, too, had meetings with certain foreign ambassadors, for example the British ambassador who tried to convince me on two occasions that Rio Tinto was in fact green energy"*(N1, 2021). These pressures have consolidated Anti-western narratives among the public, the right-wing opposition, and even in some pro-European parties. Despite the abovementioned pressures, all of the pro-European coalitions have positioned themselves firmly against Rio Tinto in 2022. Elections (Danas, 2022). The parliamentary elections in 2023 had one big, dominantly Pro-Western coalition and a few right-wing coalitions. Several of the right-wing parties merged with the ruling coalition after the elections, which was expected due to their ties and narratives; therefore, focus will be on the biggest pro-EU coalition. The main slogan of one big opposition list was "Serbia against Violence" (Serbia Elects, 2024) due to the mass shootings and the government's reaction from May 2023 that sparked protests against widespread violence (Al Jazeera, 2023). These protests have evolved into resistance against the general state of affairs and the ruling coalition, which resulted in the aforementioned elections, where the Jadar project was marginalised. The opposition lost in the elections, which the EU Parliament evaluated as unjust, calling for an independent investigation (European Parliament, 2024).

This is one of the more important exemplars of the opposition's necessity to balance its critiques towards the EU and its institutions. Most of the opposition has a platform aligned to the pathway towards Serbia accession to the EU, which situates the EU as its strategic partners and, attempts to get external support (N1 Belgrade, 2024), as Serbian institutions and media space are biased and lack democratic progress (European Commission, 2025). On the other hand, other EU institutions are turning a blind eye to the very same institutional violations when their interests are in question: as evidenced by the overruling of revocation of the Spatial Plan designed for Jadar (Balkan Insight, 2024) project and the visit of EU officials to sign the MoU right after (Government of Serbia, 2024).

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In addition to this, with regard to the Jadar project, opposition finds itself in particularly complicated position. When it comes to internal audiences, it addresses its supporters, trying simultaneously to gain sympathies from passive voters and disenchanted ruling majority voters, reversed by continuous government's support for the Jadar project. Simultaneously, they are addressing the EU institutions regarding the misuses, law violations and pressures imposed by the government, state institutions and Rio Tinto (Balkan Green Energy News, 2024). With the growing anti-western sentiment and disenchantment with the EU (Ivković, 2024), the paradoxical balancing of the critical voices towards proponents of Jadar Project while maintaining the vision of European future with virtues of democracy, social justice and environmental standards became complicated. While European institutions represent the main source of international support for the opposition, majoritarian support for the Jadar project from the EU is a risk for the opposition to lose an already declining support.

Main Results

Based on the case study of the Jadar project in Western Serbia, the main findings reveal that the pursuit of a green transition, when mediated by a specific socio-political and geographical context of Serbia, can generate severe environmental and social costs that critically undermine its sustainability and perceived benefits and create social division. The Jadar case acts as a cautionary tale, illustrating how the global demand for critical raw materials can exacerbate local injustices and create potential for creation of new sacrifice zones in the name of a greener future.

The purported benefits of the project are predominantly macroeconomic: Rio Tinto and the Serbian government promote the Jadar mine as a catalyst for regional development, promising over 1,300 permanent jobs and significant state revenue totalling €696 million over 40 years (Rio Tinto Srbija, n.d.). Furthermore, the project is observed as Serbia's contribution to the European Union's green and digital transition, supplying essential lithium for electric vehicle batteries (EU Batteries Regulation 2023/1542). This alignment with the EU's strategic interests was partially formalised through a Memorandum of Understanding in 2023, positioning Serbia within a broader European battery value chain.

However, these benefits are heavily contested when weighed against the profound environmental and social costs identified in the case study. Environmentally, the project threatens irreversible damage to a fertile agricultural region. Expert analyses, including from the University of Belgrade's Faculty of Biology, conclude that the exploitation would destroy biodiverse habitats, over 30% of which are priority conservation areas (Krizmanić et al., 2024). The planned disposal of mining waste in the Štavica stream basin risks disrupting hydrological systems (Ristić et al. 2024), and previous exploratory drilling has already led to toxic leaks of arsenic, boron, and lithium, contaminating groundwater and soil up to 20km downstream (Đorđević et al., 2024).

Socially, the costs are manifested as community disintegration, a deep erosion of trust, and a sense of injustice. The local population, who mostly work in agricultural, faces the direct threat of displacement and the destruction of their livelihoods. There are several tactics of purchasing and dismantling properties, creating intense pressure and intimidation for holdouts. This has fostered a pervasive sense of betrayal, exacerbated by the company's initial concealment of the project's full scale and the government's failure to ensure transparency. Public distrust is amplified by Serbia's context of high corruption and low media freedom, and by the vivid precedent of environmental devastation from around the Zijin copper mines, which has cemented the fear of the Jadar region becoming another "sacrifice zone."

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Discussion and Conclusions

The turbulent 1990s in Yugoslavia deeply affected the mining sector. UN sanctions led to oil scarcity, a lack of spare parts, and redirected fuel and explosives to war efforts. Skilled workers left, and state-led geological surveys were halted as capitalism was reintroduced and socially owned capital dismantled. The role and rights of the state to manage public mineral resources declined in favour of private investors' interests. This corresponds to Rio Tinto's expression of interest into Serbian boron reserves in the 90s which led to their discovery of the mineral jadarite, all building upon the explorations and maps created in the period of systemic public management of geological resources. This trend can also be traced in the changes to the mining and geological survey legislation.

The law of 1995. (Narodna skupština Republike Srbije, 1995) provides the rights of a private entity to be the bearer of both exploration and exploitation rights . But, the exploitation permit was granted only after a public auction. The legal changes of 2006, which was a period marked by neoliberal reforms, resulted in the public bidding process being dropped from the law (Narodna skupština Republike Srbije, 2006). The law of 2011 (Narodna skupština Republike Srbije, 2011) kept the same approach recognizing the possibility of "the research permit holder, that is, the user of the certificate of resources and reserves of mineral raw materials and geothermal resources" to be the exploitation permit.

The biggest changes, however, were introduced in 2015. These changes established the right of the holder of the reserve certificate to automatically obtain the right to exploitation (Narodna skupština Republike Srbije, 2015). The last changes brought a very big difference which is especially important when it comes to investment-state disputes (ISDS).

The changes introduced to the Serbian Mining Law in 2015 that guarantee to the holder of the reserve certificate to automatically obtain the right to exploitation grants them the 'legitimate expectation of profit'. This is important bearing in mind that Serbia has concluded a Bilateral Treaty on Reciprocal Promotion and Protection of Investments that entered into effect in 2007 and is applicable when it comes to Project Jadar as Rio Tinto the mining company is considered as a British entity. These changes basically guarantee the right to exploit in the case in which reserves are found gives the Investor an advantage in the dispute.

In recent years, the EU has shifted its focus toward adopting legal frameworks aimed at reducing its dependency on China and increasing security in light of growing tensions caused by wars on the periphery of Europe. In an effort to overcome resource dependency on China and to achieve the goals set by the Green Deal, the EU adopted the CRMA in 2024, which defines the critical raw materials necessary for implementing the digital and green transitions (EC, 2024a). Among these materials is lithium, discovered in Serbia in the early 2000s.

In addition to the CRMA, the EU Battery Regulation also emphasizes the importance of lithium for the production of batteries essential for these transitions (European Parliament &and Council, 2023). The adoption of this regulation led to the signing of the MoU, which between the EU and the Republic of Serbia. This memorandum defined the strengthening of strategic partnerships between the two parties regarding critical raw materials, batteries, and electric vehicles (EVs) (European Commission, 2024b). The document states that this cooperation should lead to improved political relations, economic growth in both Serbia and the EU, and also assist in Serbia's EU accession process. The significance of critical raw materials in Serbia's accession process is underscored by the fact that among the "Main EU legislative proposals or policies

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targeted" listed in the EU Transparency Register for the company Rio Tinto, "Serbian EU accession" is included (EU Transparency Register, 2024).

This case study raises the question of how all this affects investigates how these policies impact the local Jadar community but also and the country Serbia as a whole, raising the key question:. Does this transition bring local benefits, or is it in fact a sacrificial process during what is called a just transition? Lithium is a mineral primarily intended for use in the automotive industry and electric vehicle production. However, the share of electric vehicles in Serbia is just 0.5996%, a figure achieved largely thanks to significant subsidies the government provides for EV purchases (Eurostat, 2023), which often leads the public to conclude that this mineral will not be used to meet local needs.

As this project has not yet been launched, primarily due to strong public opposition, its potential impacts on the community and environment remain unclear and are mostly reduced to predictions based on Rio Tinto company documents, which have been revised multiple times. In our case study, we aim to show the impacts of the green transition on Serbia, a country in the EU accession process, i.e., a semi-peripheral country, through discourse analysis of various political actors as a continuation of some previous analysis done by others (e.g. Šterić, 2023). We begin with a discourse analysis of EU officials, then representatives of the ruling Serbian Progressive Party, and finally opposition actors. We chose to expand the final section beyond just opposition politicians to include frequent arguments from the broader public, highlighting the social impact of the project, especially through the presentation of non-economic losses within the "Loss and Damage" framework (UNFCCC, n.d.).

Non-economic losses

Aside from the economic risks discussed above, we summarise other potential risks and less tangible consequences the project would likely cause. These impacts correspond directly to intangible Loss and Damage, as defined under the Warsaw International Mechanism for Loss and Damage (UNFCCC, n.d.), which emphasises harms that cannot be quantified or restored through financial compensation—such as cultural loss, disruption of social cohesion, and the degradation of ecosystems that underpin community identity and wellbeing.

A significant shift from farms to pits and waste facilities is not a neutral conversion of land use but a transformation of the social ecology of the Jadar region. This includes the erosion of farming livelihoods, the breaking of intergenerational ties to land, and the weakening of local food systems. Even in a best-case scenario of compliance with “highest standards,” the baseline alteration of landscapes and waterscapes introduces irreversible changes to the lived environment, resulting in psychological stress, uncertainty, and the loss of place-based identity.

When it comes to a traditional lifestyle lasting for centuries, it would be significantly changed as a great amount of agricultural and livestock farming land would be lost through repurposing. In addition, Paulje necropolis, located nearby, is one of the biggest central Balkans cemeteries from the Bronze Age (Filipović, Bulatović, and Gligorić, 2022)

The realisation of the project would endanger the ecosystem in the long term, with 145 species of both flora and fauna in the area having the status of protected species (Ministry of Environmental Protection, Republic of Serbia, 2022).

Deeper conflicts within the local community

It must be considered that the Jadar project has divided the small community into those willing to cooperate with the company and sell the land and/or house, and those opposed to it. We can easily

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predict the consequences (Bebbington et al., 2008; Marca Lazo, 2022; Roche et al., 2024; Jerez, Garcés, & Torres, 2021, Velicu, I., & Kaika, M, 2017) for the people who do not have resources for migration outside of the area in case the mine opens. With the decline of agriculture and livestock farming, along with economic activity around them, some of the residents would be negatively incentivised to work for Rio Tinto. In the eyes of the others, that would make them collaborators.

Political demobilisation

As mentioned, about 5% of Serbia's population has signed the petition against the mine, while some of the most populous gatherings in recent history have been sparked by this project. These have gathered people across the political spectrum along with those considering the project not as a political question, but as a question of "survival" (Rajković, 2022; Perisic 2025). The struggle that preceded major opposition to Rio Tinto was "Defend the rivers of the Old Mountains", where the locals and people all over the country joined, representing a rare and successful conservation projects. With this halted construction of mini hydropower plants in the area of Old Mountains, people became more hopeful and trustworthy about the efforts of local environmental movements.

The Jadar Valley is one of numerous active exploration sites in Serbia managed by a variety of foreign companies. With the Jadar project implementation, investors and authorities in other places in Serbia would have a project to point to in the media, while, more importantly, a lost battle over this project could significantly weaken any future conservation efforts. This would work in two ways: other locals and all the actors joined in the anti-lithium struggle would demobilise due to defeat in the battle, joined by the wide ideological spectrum of opposition parties, consensus in the scientific community, and most importantly, people from all over Serbia coming to rallies in Gornje Nedeljice and the capital. To pinpoint again, even the declarative stoppage of the project was a precedent for the current government, and they would not have even considered it if the public opinion polls were not showing the magnitude of the opposition towards it.

Taken together, the Jadar case shows that the pursuit of "green" growth in a semi-peripheral context like Serbia is experienced less as an opportunity and more as an unfolding loss. Interpreted through the lens of Loss and Damage, the project entails not only projected material harms—pollution, biodiversity loss, displacement—but also anticipatory and already-felt non-economic losses: erosion of trust in institutions, weakening of intergenerational ties to land, and a profound sense of uncertainty about the future. These forms of harm are not easily captured by conventional cost–benefit analyses or narrow transition metrics, yet they are central to how local communities understand what is at stake. The discourse analysis demonstrates that while EU and government actors narrate the project as a contribution to decarbonisation and European integration, affected communities and critical experts frame it as a process of dispossession and imposed risk, challenging the idea that green transition is inherently benign or "just."

From an environmental justice perspective, the Jadar project exemplifies intertwined distributive, procedural, and recognitional injustices. Distributively, environmental risks and livelihood losses are concentrated on a rural, economically vulnerable population, while the anticipated benefits are framed in terms of national growth and EU value chains. Procedurally, key decisions unfold through opaque negotiations, shifting legal frameworks, and belated or symbolic consultation, marginalising local knowledge and democratic participation. Recognitionally, the ways of life and territorial attachments of farmers and rural residents are treated as expendable in the name of European decarbonisation goals, marking the Jadar valley as a potential sacrifice zone for distant climate and industrial agendas. These dynamics are not accidental side-effects but are embedded

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in the multi-scalar governance of critical raw materials. Jadar is not only a local conflict over a mine but a paradigmatic example of how loss and damage, environmental justice claims, and sacrifice zone dynamics are produced and contested within contemporary green transition politics.

Recommendations

The Jadar case reveals how green transition policies, when shaped by geopolitical urgency and extractivist logics, can sideline community wellbeing, reproduce historical inequalities, and normalise the creation of sacrifice zones. To ensure that transition pathways in Serbia and similar semi-peripheral contexts align with principles of justice, democracy, and long-term socio-ecological sustainability, the following recommendations are proposed:

Embed non-economic Loss and Damage into transition governance

Current regulatory and planning frameworks fail to account for cultural, social, and ecological harms that arise long before extraction begins. Serbia and the EU should: recognise intangible losses—erosion of trust, cultural displacement, community fragmentation, uncertainty—as legally relevant impacts within environmental and mining legislation. Require EIAs and strategic assessments to include indicators for non-economic Loss and Damage, co-designed with affected communities. Ensure that no mining project advances without clear, independently verified evidence that non-economic harms have been fully assessed and minimised.

Prevent the creation of sacrifice zones

To avoid repeating patterns seen in other extractive regions such as Bor, policy must shift from managing harm to preventing it: Introduce legal "no-go zones" for mining in areas of high agricultural productivity, priority habitats, or significant cultural heritage. Require cumulative-impact assessments that evaluate the long-term, systemic risks of concentrating hazardous facilities in rural or economically vulnerable areas.

Rebalance transition policy away from extractive dependency

The Jadar case demonstrates how semi-peripheral countries are pressured to serve external industrial supply chains rather than local transition goals. To counter this its necessary to prioritise policies based on sufficiency, circularity, and material demand reduction (e.g., battery recycling, repairability standards, reuse targets) to lower reliance on primary mining. Reassess national energy, mobility and industrial strategies to ensure that potential critical raw materials extraction aligns with Serbia's own transition priorities rather than primarily European industrial needs.

Lessons from Jadar call for a transition model that rejects the logic of sacrifice zones, recognises and prevents non-economic harms, and places democratic participation and community wellbeing at the centre of decision-making. Without these shifts, green transition policies risk repeating extractivist patterns under a new colour, deepening rather than resolving socio-environmental injustices in Serbia and beyond.

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1.13 Case study 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations

Overview

This case study explores the potential for green transformation in Croatian tourism industry focusing on five key urban tourist hubs (Zagreb, Pula, Split, Dubrovnik, Zadar). Research addresses gap between growth-oriented tourism industry generating more than 20% of the national GDP (and 90.000 jobs) and unsustainable extractive practices that irreversibly change urban landscapes and social wellbeing with their high environmental footprint, pressure on poor public infrastructure and detrimental impact on spatial/urban planning and housing. This study focuses on the environmental and social footprint of tourism activity in five selected Croatian cities (Zagreb, Pula, Dubrovnik, Split, Zadar) thus exploring transformative potential toward green transition and needed policy shifts to counter overtourism. Research also aims to identify evidence of policy gaps that measure and evaluate tourism resilience exclusively in economic and service-related terms, while neglecting severe environmental and social detrimental impacts of overtourism. Additionally, EU, national and local levels of policy making and their potential agency are closely examined to identify blind spots and coordination gaps in the implementation of various green policies.

With almost 20% of the national GDP originates from tourism (15.5 billion euros and more than 20 million tourists in 2024) Croatia profiles itself as one of the key European tourist destinations. Yet, absence of measures to adapt tourism to climate change and mitigate its carbon footprint, environmental degradation and adverse social impacts (mainly on housing, labor rights and public services) have appeared to be instrumental in undermining deeper and systemic ecological transition in this industry. Case study explores seven policy/sectoral areas in selected cities to provide a more detailed and in-depth outlook on the stage of ecological transition in the tourism industry. Furthermore, study places discussion in the contradiction between development of eco-tourism as a specific sub-industry vs. green transformation of the overall tourism sector.

The EU tourism policy, driven by the *European Agenda for Tourism 2030* and the *Transition Pathway for Tourism* aims to develop resilient and sustainable tourism model for Europe by focusing on green and digital transitions, resilience and inclusion, skills development, and an enabling policy framework. Yet, our as our research shows, in case of Croatia, it appears that this policy framework is still too weak and without enforcing mechanisms to support substantive policy shifts toward integration green transition principles within tourism industry. Hence, our research aims to identify number of opportunities where the agency of local/municipal governments can be instrumental in pushing toward green transition objectives.

Accordingly, this study will observe to which extent tourism industry in Croatia, one of the key tourist destinations in the EU, is integrating objectives of the green just transition. Being an 'elephant in the room', adverse social and environmental impacts of tourism are often invisibilised in order to allow 'business as usual', further extraction and generation of profit. Taking into account the high national priority given to tourism sector, solid number of jobs but also irreversible adverse impacts on life of people and the nature, study will explore if and how green just transition is being implemented in the tourism industry.

Research questions

Case Study Research Question:

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What is the transformative potential for ecological transition of tourism industry in Croatia, with focus on main urban touristic destinations?

Empirical questions:

- *What are the key adverse environmental and social impacts of touristic activity in selected cities?*
- *Where are the key systemic obstacles for ecological transition in tourism sector?*
- *What are the cities responses and municipal policies to prevent or address adverse environmental and social impacts of (over) tourism?*

Tourism sector is selected as the field of our exploration due to its specific role and place in Croatian economy. While it appears to play a vital breadwinner role in maintaining and strengthening national economy, due to its economic power and related interests, it has a high level of autonomy. That often means its operations are not monitored with scrutiny neither it is exposed to any type of enforcing mechanism in the context of green transition. In our research we depart from premise that key national stakeholders in tourism industry use the coordination gap to continue with monetary extraction and environmental degradation, while not being forced into systemic decarbonisation of the sector or alignment with local community needs. Absence of eco-social state model and prioritisation of short-term profit and increase of growth rates by most of the governments in the past has enabled touristic operators to continue with unsustainable practices. Therefore, green transformation of tourism sector, if implemented, would have a strong impact on decarbonisation of the national economy. Since it is, if not absent, extremely limited, we will explore which obstacles play most significant role and how cities can overcome them in the near future.

In this exercise we will focus on environmental costs of green transition in tourism sector; namely, high carbon/environmental footprint, intense resource consumption, pollution and climate vulnerability comparing it with potential benefits manifested in increased number of sustainable practices, primarily in the transport, energy/resource use and spatial development/construction. Likewise, social costs will be addressed – where applicable - such as wild urbanization, lower quality of life and increased prices of housing compared to significant contribution of tourism to GDP, increase of employment rate and job creation potential.

Methods

This study uses Green Paths Methodological Matrix and employs mixed-method approach using various tools for data collection: literature overview, secondary data review, discourse analysis and policy review with primary data drawn from field work. Our research focus is relying on the Loss and Damage concept where our analysis aims to demonstrate harmful impact of current extractive model of tourism taking place in key urban destinations in Croatia. Review of literature has been conducted to provide necessary information about the key strategic objectives of tourism at policy level – EU, national and local level. Reviewing secondary data from Ministry of tourism, Croatian Tourist Board, Croatian Bureau for Statistics and EUROSTAT and limited body of research on the topic we explored in-depth environmental and social impact of tourism. Discourse analysis was applied to speeches from key stakeholders, reports and media statements.

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The study defines costs as environmental degradation, growth dependency and increase of social inequalities while benefits promoted by tourism industry stakeholders are economic growth, job creation and international reputation.

Environmental impacts are examined in 5 policy areas (1) transport, 2) resource efficiency 3) climate change, 4) energy and waste, 5) spatial and urban planning where objective was to gain basic insights in footprint of current model of tourism. Social impacts were explored in two additional areas, namely 1) housing and 2) public infrastructure and public services. Stating the development of tourism in these areas and relating it to the concept of "growth dependency" research has created a mental map situating tourism as significant disruptive element when addressing green transition objectives. With aim to explore potential of tourism model to be transformed into non-extractive economic activity, we further engaged into stakeholder analysis identifying various roles and interests in green transformation of tourism.

Findings and Results

Tourism as winning card or dependency?

Key findings in these case study show that recognition of the climate challenges related to tourism sector in Croatia is scarce, non-systemic and slow. Key stakeholders – namely Ministry for tourism and Croatian National Tourist Board – pay insufficient attention to tourism industry climate vulnerability and even less to environmental impacts of tourism. Monitoring of results is primarily related to growth metrics where success – or lack of it - of certain year or season is measured through number of tourists/visitors, duration of their stay, expenditure during their stay etc. That also shows framework through which policy makers approach to tourism, neglecting social and environmental impacts of tourism industry. Yet, water scarcity, heat waves, noise and poor communal infrastructure are increasingly becoming weak points recognised by tourists or local communities thus decreasing ‘’attractiveness’’ of destination. In most of the tourist hubs there is increasing number of real estate speculation cases (decreasing availability of affordable housing), overtourism and intense resource consumption (primarily water, energy). Hence, sustainability is still perceived by key policy makers merely in the economic terms. While that is understandable in the country that depends on 15 billion euros earned from more than 20 million tourists (annually) and more than 100 million overnight stays by visitors from Germany, Austria, Slovenia, Poland and Czech Republic, most concerning fact is that both social and environmental costs of industry activity remains neglected or overlooked. Sustainable tourism is therefore often perceived through ’business as usual’ that would guarantee continuous growth of industry – and income - without deeper systemic adaptations or coordinated transition to fit the planetary boundaries.

Integration of climate policies in the tourism sector moves rather slowly and without sufficient enforcing power though European Green Deal and National Recovery and Resilience Plan have given stronger impetus to this change. Yet, ’on the paper’ there are more evidences that Ministry of tourism aims to integrate some of the measures that have to integrate climate change in the planning procedures, create resilience in relation to extreme weather events, educate personnel working in the sector and increase resilience of local communities which depend on tourism. There are also some positive examples and interventions, though at micro-level, where forestation was implemented to compensate for the carbon footprint of the visitors using road traffic while entering the country.

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At the governance level there is weak coordination between Ministry of tourism and Ministry of environmental protection and green transition. Increasingly, Ministry of physical planning, construction and State assets is becoming more and more relevant due to announced legislation which is expected to open doors for tourism related investments. It is expected that new Law will enable investors to further disrupt the real estate market and land-use in the country. Critics of the Law fear that it will create urbanistic chaos to the detriment of local communities and enable plunder that was experienced in previous decades in many other countries (Spain, Greece etc). On the other side, Ministry for environmental protection and green transition which is accountable for implementation of Climate change adaptation strategy identifies tourism as one of the most vulnerable sectors, yet its implementation is lagging behind and reporting on its success remains limited to narrow group of policy makers. Prevailing narratives on role of tourism are framed with positive tone to increase public acceptance of the industry and maintain high status at the level of country's priorities. Innovative campaigns are framed (such as 'Croatia; naturally yours') that aim to connect natural beauty with attractiveness of destination, still often failing to report on the detrimental environmental and social impacts on local community and eco-systems (for example; more than 3 million people annually visit in total 8 national parks in Croatia). There is prevailing 'silent consensus' that detrimental impacts of tourism should not be addressed publicly as they could deepen social conflicts and damage reputation, but also decrease lion's part of the income from tourism (almost ¼ of the GDP).

Local communities and municipalities in this constellation are perceived by State through extractivist lenses, merely as sources of income through taxation and visitors expenditures, while risks and costs of tourism are fully socialised by local inhabitants and municipalities.

Another positive example, yet with limited visibility and rather low impact, is CROSTO – Croatian Sustainable Tourism Observatory. CROSTO is part of UNWTO International Network of Sustainable Tourism Observatories (INSTO), which was created in 2004 with the main objective to support the continuous improvement of sustainability and resilience in the tourism sector through systematic, timely and regular monitoring of tourism performance and impact and to connect dedicated destinations in order to better understand destination-wide resource use and foster the responsible management of tourism. CROSTO, for example, follows closely consumption of energy, water and creation of waste across the country. Furthermore, in 2024. UN Center for sustainable tourism has been established in cooperation with Ministry of tourism and University of Zagreb but its operations have not yet started.

Cities as machines of growth – and tourism

In these scheme cities play very important role. In five cities we've selected for our exploration – Zagreb, Split, Pula, Zadar and Dubrovnik – almost 60% of the visitors and related touristic activities take place. With tourism, cities play the role of 'machines of growth' which is of strategic importance for the State, which suffered from severe deindustrialisation in past decades. According to Herman Daly, cities around the world depend on growth, but such growth has become uneconomic—the costs of growth, within and beyond the cities' boundaries, far exceed the benefits. Furthermore, Varvarousis claims that cites should, in order to avoid growth dependency trap, limit the financialization of their assets, socialize basic infrastructures and spaces, redistribute income, and guarantee access to services, decoupling human well-being from growth in this way. Cities have to control tourism by not branding cities as tourist destinations and managing tourism by addressing the underlying forces that drive its growth, not just by limiting visitor numbers.

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For example, Herman Daly proposed increasing taxes on social bads, such as resource use and pollution, and decreasing taxes on social goods, such as labour. A major social bad in cities today is real estate speculation. Speculation drives up housing prices, making home ownership and rentals unaffordable for workers and long-term residents. When a city is targeted by speculative real estate markets, this often leaves thousands of housing units vacant, since speculative buyers consider renting unfavourable because they want to quickly sell their properties at the next real estate price hike.

Varvarousis and authors say that tourism is becoming a major source of income in many cities and, in extreme cases of overtourism, a monoculture with distorting effects on the economy, the environment and local culture, driving gentrification, displacement, and job precarity. They invite all cities to end promotion and support of tourism growth—such as closing (publicly financed) promotion agencies, stopping fiscal subsidies and exemptions for tourism investments, cancelling new tourism-related infrastructures, and banning mega-events. This would also involve significant reduction of offers of accommodation by limiting short-term rentals, hotel rooms, and tourist-oriented restaurants and bars and creating better conditions for tourism industry workers through the prohibition of subcontracting and outsourcing, decent wage standards, and prohibition of work on Sunday and holidays. Also, those who profit from tourism would need to pay for the extra burdens tourists create in public infrastructure while introducing policies that protect leisure spaces used by local.

Although they are increasingly becoming aware of the detriments of tourism, Croatian cities and citizens are still far from tourism degrowth as proposed above. Fast monetary benefits are at this moment much stronger than long term visions of sustainability. Cities like Dubrovnik and increasingly Split and Zadar are irreversibly transforming into Disneylands. With few millions of tourists per year (Dubrovnik 4 million, Zagreb 2.5 millions, Split 4.6 millions) they are not hesitating to use this income for growth, turning some urban areas into sacrifice zones, avoided or literary abandoned by the local residents. Main contradiction originates from the fundamental conflict; cities and municipalities use tourism as engine of their growth, however risks related to social and environmental costs are socialised, where citizens bear the burden of poorer quality of life and extensive pressure on resources and surrounding eco-systems. While tourism brings advantages of jobs creation and decrease of unemployment, distribution of the income is still centralised and benefits the State whereas cities are left with inadequate resources to modernise and adapt their infrastructure to massive influx of tourists and climate challenges.

Except the Zagreb, as Croatian capital, all other tourist hubs are placed in the coastal area of Adriatic sea. There are strong indications, such as in the EU blue economy report, which confirm that climate change is projected to have a profound impact on the coastal tourism sector. Rising global temperatures, rising sea levels, and increased frequency of extreme weather events will alter the physical environment, ecosystems, and amenities that underpin coastal tourism. The erosion of beaches and coastal infrastructure is a major concern, as rising sea levels and increased storm intensity will lead to the loss of tourist facilities, such as hotels, restaurants, and recreational areas. A study on the regional impact of climate change on the demand for tourism in Europe has shed light on the potential effects of a warmer climate on tourist flows. The study, which simulates future impacts up to 2100, reveals that in a scenario of a 1.5°C temperature increase, only 20% of European regions will experience a minor impact, with tourist numbers remaining relatively stable (changing by -1% to +1%). The consequences of climate change will be far-reaching and will affect not only the tourism industry but also the livelihoods of communities that depend on costal tourism. EU blue economy report also states that in the short term, investments in infrastructure, such as sea walls, dunes, and green roofs, are necessary to protect tourist facilities and amenities. Furthermore, developing and implementing climate change adaptation and resilience plans, including early warning systems and emergency response plans, is crucial for

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minimising the risks associated with climate-related events. Interestingly enough, Croatia is not covered in the EU statistics on tourism in coastal area.

City of Zagreb

With 1.5 million of visitors and 2.6 million of stays Zagreb is becoming more attractive destination with increasing number of events. In 2024 more than 4 million passengers have been tracked on Zagreb airport with significant GHG emissions linked to aviation. Some cities like Amsterdam are, with support of Dutch government, actively limiting air traffic to curb nuisance, reduce noise, and control tourism, primarily by cutting flights, raising fees for airlines (like a big 2025 hike), and implementing stricter night curfews, aiming to balance economic benefits with quality of life for residents.

In Zagreb, more and more hotels use solar power systems for water heating and solar panels on their roofs. City of Zagreb also offers subsidies and provides financial support for energy efficiency and restoration of hotels. In 2025 there were more than 10 000 accommodation units, which is 25% of increase in comparison to 2024. Tourist boom creates irreversible changes on the real estate market, leading to drastic annual increase (24%) of housing prices. Increased number of Air'b'n'B accommodation units adds to already detrimental trends on the housing and real estate market.

Though city's green-left government has just voted (2025) new General Urban Plan which should seize the uncontrolled construction place urban planning to work for the public interest, State has adapted new Construction Law that enables lucrative and in many cases tourism induced investments. Croatian construction minister Branko Bačić for example claims that tourism is the largest consumer of the space in the country, which should be key vehicle of the country's development. Such narratives promoted by the state officials, unequivocally demonstrate the official direction that subordinate resource consumption in favour of economic growth provided by tourism.

Accordingly, Zagreb Tourist Board as one of the key stakeholders at local level pays poor attention on environmental and social costs of tourism. Brief review of their documents does not show that green transition is one of the priorities, much more focus is given to consumption patterns, yet without intention to navigate or nudge visitors of Zagreb to change consumption patterns during their stay. Yet, as destination, City of Zagreb does develop various programs and implements measures which contribute to climate mitigation. For example, City of Zagreb is actively working on implementation of cycling outdoor trails (Flow trail) which connect city with the Natural Park Medvednica enabling citizens and visitors to reach the Medvednica mountain without usage of car, what decreases GHG emissions in this ecologically sensitive area. Additionally, increase of public transport and decarbonisation/electrification of public transport fleet is permanently improved. Since 2025 that is supported with the public bicycle system (Bajs) which offers thousands of bicycles which can be used by citizens. Development of various urban biking routes across the city increases use rate of public and privately owned bicycles. Apart from transport, which is one of the most intensive carbon emitters, City of Zagreb invests into energy renovation of public buildings in the city and transition to renewable sources of energy. For example, currently more than 600 MWh is produced through installed solar panels on public buildings. Furthermore, through new practices in the urban vegetation and forestation, number of

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urban heat islands is permanently decreased, directly improving quality of life and health both for citizens and visitors. New masterplan for urban planning in Zagreb anticipates increase of green areas in the city directly contributing to reduction of urban heat islands. Yet, most of these measures are result of direct policy making in City of Zagreb, with rare if not absent coordination with key stakeholders in tourism industry.

At the city level, there is still poor coordination among the key stakeholders (hotels, restaurants, private accommodation) to design and develop measures which would place ecological measures as their priority. This type of incentive could be expected from municipal government or tourist board and could results with more orchestrated efforts to enable green transition for the benefit both of Zagreb inhabitants and visitors.

City of Split

City of Split has always been one of the most favourable destinations and departure for many tourists visiting southern Dalmatia islands. That is often manifested in massive transport movements (more than 3.5 million of passengers on Split airport and almost 6 millions passengers through ferry port (one million cars). Despite severe climate challenges coastal area will face in near future, such high numbers related to transport have not been addressed by the key stakeholders in tourism sector. Increase of number of visitors regardless of their transport mean remains a top priority for majority of tourism operators, often neglecting traffic congestions and severe malfunctioning of public transport services in the city.

Split is known for its sunny climate which makes it suitable to use solar power. Some of the hotels in Split have already been frontrunners in installing photovoltaic panels on their roofs and their number is increasing through support of local renewable energy firms. As many of the buildings in Split centre are very old, there are challenges related to energy efficiency. Apart from that, waste management and protection of drinking water remain huge challenges for the Split region which is particularly affected by climate change.

As one of the most prominent tourist destinations, Split has experienced a rapid increase of housing units' prices, mainly related to tourism. During summer 2024. broader Split region was visited by almost 4 million tourists. Case of Split clearly shows detrimental impacts of tourism leading to gentrification and displacement of local population. Local communities often prioritise tourist demands and revenue over preserving their cultural heritage. Cultural commodification happens when traditions are transformed into products for commercial gain. Disrespectful tourist behaviour can further alienate host communities, discouraging younger generations from embracing their cultural identity. Additionally, tourism can lead to the displacement of local populations, involving forced evictions, restricted access to resources, and the exploitation of natural assets. In case of Split, many of the local residents, reportedly, rent their apartment during season and move to cheaper areas in hinterland.

Tourism does offer immediate short-term economic benefits (rent, jobs, profit), which are in the cases of poorer communities a mean of survival. Still in long term it ruins the foundation for the sustainable future. Case of Split is an example of creating rentier class which is using tourism as a cash cow, further limiting opportunities for production in already deindustrialised area. Apart from that, Split is one of the destinations facing economic leakage, where money spent by tourists

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fails to benefit the local economy and instead benefits multinational companies or international hotel chains, leaving host destination with little financial gain. As some reports show, these practices prioritise profit at the expense of local communities, often dispossessing and marginalising the original inhabitants. Apart from that, during season high increase of prices, leads to inflation of living costs, making essentials like food and housing less affordable for locals. In 2025 prices of food in Split have reportedly increased almost 50%. For local population, increase of these prices creates a high discontent with the quality of life in the city. Case of Split shows that further growth of tourism in the city significantly surpasses city's capacity and goes far beyond the biophysical, social and cultural limitations.

City of Dubrovnik

Many features described in the case of Split can apply even more sharply in case of City of Dubrovnik. Due to natural beauty and UNESCO cultural heritage (old town), Dubrovnik is known as a 'southern Venice' and site where famous Game of Thrones has been filmed. While City of Dubrovnik has a bit more than 40.000 inhabitants outside of the season, its airport traffic is more than 3 million people (2025). Dubrovnik is most visited destination in Croatia, with more than 1.4 million visitors during 2024. Most of them visiting Dubrovnik pass through the old town. Apart from air traffic that clearly demonstrates a striking carbon footprint linked to visit to destination, Dubrovnik is one of the destinations mostly visited through cruising tourism. Almost one million passengers from cruising ships visit City of Dubrovnik throughout the year. Recently, City of Dubrovnik started to limit daily arrivals to around 8,000 passengers to face overtourism. Apart from evident environmental risks linked to cruising tourism, a frequent fluctuation of tourists generates large amount of waste increasing pressure on the communal infrastructure and public services.

Housing and real-estate prices in Dubrovnik are highest in the country already for many years, they are compared with prices in Paris, Rome or Venice. Old town Dubrovnik has experiences full gentrification, losing one third of its inhabitants. Apart from the sky rocketing prices of food and housing, local inhabitants are faced with various pressure to abandon the old town.

Case of Dubrovnik is also known for the speculative investments. Most recent case links to case of Srđ golf playground on plateau Srđ which was used as a paravane for building a luxurious resort for global elite. This project has been opposed and challenged by the local environmental group Srđ je naš which fought its legitimacy for more than 15 years. Though, constitutional complaints have been accepted in 2025 after marathon struggle, the new Construction Law opens door for thousands of similar cases with self-evident extractivist aspirations. Being frontrunner in tourism, Dubrovnik is the first city in Croatia which aims to radically confront the overtourism. According to the Responsible Travel agency, Dubrovnik has been ranked the most overcrowded city in the world, with 27 tourists to every resident at its peak. Municipal government wants to counter further displacement from the Old Town and keep the sense of community, eroded by tourist accommodation and high property prices.

This case shows that municipal governments have enough power to limit the unsustainable model of tourism once the population discontent becomes high making life in the city unbearable. This first step toward tourism degrowth is more 'degrowth by disaster' but still it traces the path for more sustainable tourism.

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City of Zadar

City of Zadar in central Dalmatia is becoming increasingly popular as destination, following the unsustainable pathways of its older predecessors, Dubrovnik and Split. This medieval town with 70.000 inhabitants attracts almost 700. 000 tourists mainly from Germany, Poland and Austria during one year, experiencing stable 20% of increase in last few years. Zadar airport has identified 1.5 million passengers only during 2024.

Zadar is also not exception when it comes to detrimental social impacts of tourism. Due to severe damages experienced during war and needed reconstruction, Zadar has entered in its tourist renaissance much later. Now it is quickly catching up becoming one of the most attractive destinations, being close to many natural parks. While housing prices are rising with slower pace, there is increase of short-term accommodation units, traffic congestions and parking zones. Furthermore, inhabitants report many cases of cultural commodification, particularly in cases of the old town that is adapting to the demands of tourists. Accordingly, justification and overtourism are gradually becoming part of everyday life. Small ports, promenades and green zones are examples of sustainable projects, but traffic and public services remain a huge challenge for local government. Still, city is caught between vision of sustainable tourism and direct response toward the needs. For example, few thousands of new parking spots to be built in few new garages as presented and perceived as solution, without further questioning of the road traffic as the key transport solution.

City of Zadar has developed a regional climate strategy to cope with the detrimental impacts of climate change such as floods, heat waves and biodiversity loss. Yet, again, this strategy obviously conflicts with general trend of increasing number of tourists, parking spots and air traffic that is supposed to confirm success of tourist season, each time with higher numbers.

City of Pula

Old roman town Pula on Istrian peninsula is one of the key tourist destinations in the Northern Adriatic. Close to Slovenia and Italy, this 50 000 inhabitants city is hosting almost half a million of tourists during the year, arriving mainly through road traffic from Slovenia, Italy and Germany. City of Pula has its own airport, though the traffic to this airport remains relatively limited. Therefore, most of the GHG emissions originating from transport are directly linked to road traffic.

Due to constant increase of number of visitors City of Pula is also facing rapid gentrification and increase of housing prices. Various investments – primarily new hotels – are planned to emerge in the broader area of Pula responding to demand of the tourist markets. Very often spatial and urban planning is ‘written’ by the investors whereas local government offers a broad range of privileges. Yet, due to developed civil society and inhabitants that appreciate good quality of life, many of speculative investments are directly contested by citizens. Most recent successfully contested case was related to location of water purifier which was planned to be located next to key city promenade.

City of Pula is faced with heat waves, floods, draughts and increase of sea rise. Due to changes in climate, local tourist stakeholders aim to decrease the tourism induced pressure through

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summer through creation of full year touristic offer which would anticipate climate change impacts.

As one of the most developed regions of Croatia, Istrian peninsula has been for many decades profiled as elite tourist destination in accordance to sustainable development criteria. Unlike the destinations in Dalmatia it has created a profile of eco-tourism destination, still in most of the cases available to upper middle-class visitors. In broader Pula region, there are many tourist operators who implement various best practices, from cyclo-tourism, nature friendly accommodation, incorporating local food producers etc. Due to its mild climate, Istria can develop its touristic offer in more balanced way decreasing number of visitors during the summer and ease the burden of massive influx of tourists during one period of the year.

Main Results

Findings have demonstrated that green transformation in the tourism industry is still underdeveloped at national/local level and that relatively weak regulation at the EU level does not play a decisive role in the green transformation of the whole sector. Furthermore, it has revealed a number of gaps and blind spots in coordination between key local and national stakeholders in the tourism industry, cities and ministries accountable for green transition. Furthermore, key trends in the industry show that sustainable tourism is perceived rather as one of the avenues for industry's development rather than result of the overall systemic transformation of the whole sector.

Taking into account important role of tourism contribution to the GDP and to national economy, our research shows that tourism industry landscape, particularly in selected tourist urban destinations, is characterized by prevailing growth orientation that relies on numerous extractive practices, gentrification and commodification while neglecting environmental and social impacts of tourism activity manifesting in rapid increase of real estate prices, incremental decrease of labour rights and excessive pressure on public infrastructure leading to lower quality of life in tourist urban destinations. Furthermore, findings demonstrate limited capacity for trade-offs between economic benefits from tourism industry on one side and mainly detrimental environmental/social impacts of industry. Absence of enforcement mechanisms at EU level coupled with voluntary nature of stakeholder's commitments at national/local level undermine the green transformation of tourism industry thus placing short-term orientation on immediate monetary gains without significant payback to local community and re-investments in the public infrastructure.

Our findings show that in such constellation key winners are "business-as-usual" players which generate direct profit through massive tourism orientation, mainly multinational companies that offer services accommodation (*Air B'n'b, Booking*) and air transport. These two activities contribute significantly to unsustainable practices in spatial planning and gentrification, but also to a high environmental footprint. Another party that has a key interest in lifting environmental constraints for tourist operators is the State itself, as it highly relies on income from tourism.

Key losers are citizens and local communities who might have limited short-term gains, but in the long term they lose the opportunity for affordable housing in their urban environments and experience further decrease of quality of life and public services. Furthermore, irreversible changes in eco-systems, particularly due to sea pollution, water scarcity, biodiversity loss, and irregular waste management make the life of local communities less sustainable.

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In overall, findings also indicate that in cities which are key urban destinations there is, contrary to state, growing awareness of local policy makers based on the need to regulate tourism activity and develop mechanisms and policies which can decrease their climate vulnerability and neutralize local social impacts. Yet, they lack both human and financial resources to address this in systemic manner. In most of the cases, these interventions are not directly related to green transition itself, but to achieving sustainability if not a mere survival for many.

Discussion and Conclusions

Clearly, tourism industry in Croatia is far from goals of the just green transition. Key protagonists claim that massive tourism is not their ambition, yet figures show opposite. There is also striking contrast between the scale of the profit originating from tourism and poor re-investments into municipal public infrastructure. Cities and municipalities bear the burden of both social and environmental risks caused by tourism activities. Industry's sustainability is perceived primarily through the economic/growth perspective and maintenance of the extractive character of industry. In the official narratives, growth of tourism is closely linked with the continuous focus on the GDP growth thus sidelining potential constraints and limits related to green policies. As many inhabitants particularly in the coastal area live from tourism, they are too, hesitant to support any measure that would limit continuation of touristic activity. Very often that is linked to economic and social status: those who are more privileged to own apartments and earn from rent, very often have different positions from the poorer strata of inhabitants who are less and less able to cope with increasing housing prices, noise, sea pollution, food prices, lack of water etc.

Our research findings have shown striking disparity between official narratives on tourism and its role in the green transition promoted by key stakeholders and prevailing extractive practices which create detrimental environmental and social impacts. They highlight the continuing adherence of economic growth in tourism development and lack of capacity to decouple tourism model from extractive practices and growth dependency. Therefore, green transition in the tourism sector remains extremely limited, without proper reinforcing mechanisms for implementation or developed monitoring categories for environmental and social impacts. Even in the official documents at the EU and national level these destructive linkages are not sufficiently recognised, addressed or monitored in existing policies. We can group key findings in few categories:

Excessive pressure of tourism activity on public infrastructure and natural resources: evidence from field research shows that intense resource use significantly contributes to environmental footprint of tourism activity and to increase of social inequalities related to access to public services and infrastructure in selected tourist hubs. Impacts vary from use of drinking water, peaks in energy consumption, in-adequate urban planning, carbon intensive transport to lack of affordable housing and poor material infrastructure. Yet, local governments and stakeholders increasingly recognize that this development pathway is unsustainable and the need to be regulated at local level. Still, policy responses are absent, scarce or underdeveloped.

Resistance of tourism industry toward systemic transformation: maintaining 'business-as-usual' model that gives priority to short-term profit and extraction of monetary value in relation to nature protection or responsible use of natural resources. Tourism industry overall perceives green transition as a direction of development only for small, targeted and specific 'enclave' for specific target group rather than complies with imperatives for systemic transformation of whole supply chain.

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Limited trade-off capacity: cities are perceived as the machines of growth and in this framework, tourism is employed to achieve this goal thus limiting capacity to trade economic growth and generated income with social well-being and environmental justice. Various blind spots and coordination gaps at institutional and governmental level are used to maintain inefficient system characterised with lack of coordination and regulation. Yet, cities and their local communities show increasing level of recognition of detrimental impacts of tourism activity and show need to have stronger agency in creating conditions for green transition.

Weak enforcement mechanisms: voluntary commitment of key stakeholders to continue with green transition within the tourism sector and weak/slow regulation of tourism activities don't provide proper framework to implement green measures and policies. Data gaps –which are not accidental and originate from lack of political recognition of the problem– are generated primarily through inadequate framework of evaluation of results in the sector which are framed to present results through lenses of profit/income accumulation and contribution to GDP while neglecting a diverse spectrum of detrimental impacts on ecological and social well-being.

Findings have provided more in-depth overview of tourism impact on the urban infrastructure, public services, quality of life and resource use suggesting need for stronger regulatory agency of local decision makers. Since systemic character of green transformation in tourism industry is still rare or absent, this research is valuable to demonstrate huge disparity and divergencies between notion of sustainable but still extractive tourism (as one operating within 'business-as-usual' framework) and potential degrowth of tourism industry characterised by lower environmental footprint and less damage for local communities. While tourism industry seems to be for the time national ''winning card'' contributing to job creation and economic growth, status of local communities as key losers of the process remains relatively invisible and necessary capacity to manage trade-offs rather underdeveloped. This also reveals currently locked but large unutilised transformative potential for green transition which needs to eliminate blind spots, improve coordination, democratise governance and provide impetus for key stakeholders. Accordingly, without stronger enforcing mechanisms and more coherent coordination, green transition within the tourism sector is expected to maintain limited and marginal. With further urge for competitiveness voiced by the European Commission, EU policy is unlikely to significantly contribute to local governments in limiting detrimental impact of the industry.

Recommendations

Local level

- Enable/allow local governments to introduce and implement measures to motivate tourists to reduce resource consumption in tourist areas (water, energy);
- Introduce local reward schemes for sustainable behaviour changing patterns of behaviour and travel;
- Use local incentives to demotivate passengers to use air traffic to reach destinations;
- Support hotels, tourist operators and private accommodation owners to nudge tourists to use sustainable or public transport (discounts, gratis days);
- Build local public-civic partnerships and alliances to foster sustainable practices in food, transport and urban planning;

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- Increase city tourist taxes;
- Limit the number of tourists;
- Provide subsidies for affordable housing in tourist destinations;
- Develop local sustainable eco-systems that ensure local food production, renewable energy use and biodiversity protection
- Introduce forms of tourism that enable longer stays with lower environmental footprint and in-kind contribution to local community
- Motivate local tourist-operators and boards to design sustainable tourism maps and guidelines
- Incentivise and encourage use of public transport and cycling infrastructure
- Support civic or private incentives aiming to decarbonize parts of supply chain in tourism industry

National level

- Set up coordination body between Ministry of tourism, Ministry of economy, Ministry of construction and Ministry of environmental protection and green transition to align and synchronise monitoring of implemented measures;
- Modify and adjust data collection to follow and monitor social and environmental impacts of tourism
- Introduce re-distributive measures that enable local governments to re-invest significant part of locally generated income from tourist activity in communal infrastructure, services, welfare systems and eco-systems; back to local community
- Ensure policy improvement through feedback loop from monitoring and implementation level
- Increase taxes on aviation transport and give subsidies to railway options

European level

- Create new policies that recognise detrimental social and environmental impacts of tourism;
- Introduce reinforcing mechanisms to regulate tourism industry and demand monitoring at national level;
- Support regions and cities with funding programs to ensure affordable housing in tourist destinations;
- Introduce mandatory monitoring of wellbeing indicators in tourist destinations

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1.14 Case study 14: Energy poverty in Central and South-Eastern Europe

Overview

The principal area this case study aims to explore is the question of the social and environmental dimension of policy development and investment into energy poverty alleviation measures in Croatia, with comparative overview of the context in Serbia and Slovenia.

Croatia, along with other post-socialist countries in the region of Central and South-Eastern Europe (CSEE) has a high percentage of homeownership as a consequence of "right to buy" policies of privatization of the social housing stock during the process of economic and political transition from state socialism to a liberal market economy in the 1990s. Changes in the structure of ownership and consequentially management of buildings are determining differences within the socio-economic structure of population, reflecting also the capacities of households to deal with retrofitting of their homes. The (just and effective) implementation of policies of energy renewal in these countries therefore depends both on this heterogeneous socio-economic structure of owners-inhabitants, as on complicated and ineffective governance in residential buildings deciding the quality of management of investment and disinvestment.

The concept of energy poverty in European policy originated in the 2009 Third Energy Package, which introduced legal provisions for Member States to develop action plans addressing energy poverty and protecting vulnerable consumers. Since then, energy poverty has become central to the EU's energy and social agenda, reflecting the inability of households to afford adequate energy services. The European Green Deal highlights energy poverty as a critical issue, aiming to ensure a fair and just energy transition. It emphasizes renovation of buildings, energy efficiency improvements, and financial support to reduce energy bills for vulnerable households, linking energy poverty alleviation directly to climate and energy goals in the Green Deal.

In Central and South-Eastern Europe (CSEE) this is principally related to ownership structure of residential buildings so the study aims to examine the linkage between social well-being and environmental sustainability related to ownership of housing stock conditioning the process of energy renewal. Specifically, the study investigates the impact of EU financing mechanisms aimed at fostering green transition in terms of its capacity of sustaining social cohesion in order to avoid renoviction, green gentrification and segregation of vulnerable groups. It aims to provide an overview of the results of implementation of EU and national policies and funding schemes to combat energy poverty and analyse the social dimension of the European Green Deal based on the principle "to leave no one behind". In doing so, the study is targeting green transition policy interventions within the field of energy renovation in the housing sector in the EU level and local policies reflected within SECAP's - sustainable energy and climate action plans, the strategy "A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives", EU Directive on Energy Performance of Buildings, national long-term building renovation strategies, building-related aspects of EU (and non-EU) countries' national energy and climate plans (NECPs), 2020 Commission recommendation on energy poverty, local climate plans, mitigation plans - social plans for climate policy at the national or municipal level, local adaptation plans and macro-regional strategies.

Research questions

This study seeks to explore several key research questions, including how the European plan to reduce energy poverty addresses the social dimension of housing and the relationship between energy poverty and the ownership and tenancy structures of households in post-socialist countries

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in Central and South-eastern Europe (CSEE), focused on Croatia with comparative analysis of Serbian and Slovenian context. Empirically, it aims to examine the current and planned policies targeting energy poverty in this region and the data supporting these initiatives. The study also investigates the financial mechanisms employed to combat energy poverty and whether housing prices are considered in these measures. Furthermore, it identifies the most vulnerable groups affected by the energy transition in both urban and rural areas and assesses the impact of this transition on them. Finally, it explores the necessary mechanisms to ensure that energy transition in households remains accessible and affordable for vulnerable populations.

The research questions focus specifically on understanding the social dimension of energy poverty and housing, as well as the effectiveness and inclusiveness of policies addressing energy poverty in Central and South-eastern Europe. These questions directly support the objectives of the GreenPaths project by providing a detailed examination of how European policies on energy and housing impact environmental sustainability and social wellbeing in a specific geographical and socio-political context. By investigating policy measures, financial mechanisms, vulnerable groups, and housing tenures and statuses, this case study contributes to the overall project objectives of illustrating the practical social and environmental effects of EU policies. This aligns with the goal to produce a comprehensive assessment of policy linkages and to evaluate their social and environmental impacts across diverse European regions.

Methods

The research employs a mixed-methods approach, combining desk research and policy analysis on energy poverty in Croatia, Slovenia and Serbia with data collection and analysis of secondary and primary data, including conducting focus groups, holding stakeholder (NGO, institutional, professional, scientific) meetings and conducting interviews with them.

The policy analysis was conducted by mapping the procedures of implementing the European directives and policies on the national level – primarily through analysis on how energy poverty was included in the National Energy and Climate Plans (NECPs) of all three countries and analysing how many municipalities have employed their own local programmes for addressing energy poverty. Additionally, we mapped the financial allocation of funds distributed through ministries and national entities with a specific focus on criteria for accessing these funds. Within the interviews with researchers and members of civil society we have mapped the process of creating first laws that provided definition of energy poverty within national legal frameworks where civil society played a crucial role.

After conducted desk research and policy analysis, interviews with researchers and members of civil society organizations working within the field of energy poverty were organized (4 from Croatia, 2 from Serbia and 2 from Slovenia) and a focus group with decision-makers from Croatia including two members of ministries dealing with energy poverty (Ministry of Physical Planning, Construction and State Assets and Ministry of Labour, Pension System, Family and Social Policy), one member from Environmental Protection and Energy Efficiency Fund responsible for allocation of funds and a member of City of Zagreb administration as the only municipality with a programme for combatting energy poverty in Croatia.

Both within interviews and a focus group with decision-makers we have detected the gaps in the systemic lack of data on housing tenures and accessibility to information and legal procedures regarding the most vulnerable groups which are crucial for effectiveness of the measures for combating energy poverty. Based on the combination of the data collected through research, statistical data, policy analysis and interviews/focus groups we were able to assess the shortcomings of existing policies.

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Findings and Results

In the Croatian case, planned and piloted measures for combating energy poverty combine building-level technical renovation (i.e. energy efficiency upgrades) with social-welfare instruments (i.e. targeted energy benefits and eligibility criteria). National calls for energy renovation of family houses and the developing national building renovation plan are explicitly linked with social-protection objectives: calls aim to map needs of households at risk of energy poverty and to expand eligibility beyond the narrow set of previous beneficiaries, and the Social Climate Fund (SCF) - on the EU level in the 2026-2032 period - is explicitly intended to couple energy transition investments with social measures to protect vulnerable groups. In 2025, an analysis carried out by the Ministry of Physical Planning, Construction and State Assets, with the involvement of local governments, is underway to determine new categories of vulnerable households, the aim of which is to allow for the inclusion of a wider group of beneficiaries, not limited solely to the recipients of so-called "guaranteed minimum benefit".

Our analysis however shows there is a significant gap between national strategies and policies on reducing energy poverty and the effectiveness of the measures put in place. Implementation mechanisms in the Croatian case include: (a) targeted grant schemes for energy renovation; (b) social-welfare payments and energy-specific monetary benefits; and (c) local databases and outreach to identify households using high-polluting fuels. Important limits identified in practice are (i) eligibility framing that privileges property owners (e.g., proof of legalized ownership required in certain calls), (ii) narrow social-criteria in earlier schemes (guaranteed minimum benefit only), and (iii) limited mechanisms for reaching occupants of informal/unlegalized housing or tenants in multi-apartment buildings where decision-making and financing are more complex.

Following the main goals of the green transition, reducing energy poverty was included in the National Energy Climate Plan (NECP), Recovery and Resilience Plan and national legislation recognized the energy poverty within its energy policy in Croatia in the last decade. However, the implementation of these policies remains limited in scope and ineffective in addressing the most vulnerable groups. The net effect is that while measures formally integrate a social dimension, operational design (eligibility rules, legal-status requirements, building-level finance models) risks excluding the most socially vulnerable occupants unless eligibility and outreach are broadened. Economically disadvantaged households experiencing financial hardship therefore remain reliant on fossil fuels and cheaper energy sources due to the impossibility of funding renovations, while more affluent households benefit from the funding schemes provided by the state and municipalities. This also generates a dual territorial bias that privileges urban areas over rural regions, and affluent neighbourhoods over socioeconomically disadvantaged ones.

Generally, Croatia's housing stock is characterised by very high owner-occupation (above EU averages), which is a legacy of post-socialist privatisation and housing policy. High home-ownership rates mean that energy-efficiency retrofit policies targeted at owners will, in principle, reach a large share of households, but that pattern also conceals important vulnerabilities: high ownership rates coexist with low liquidity to invest in renovations, and with concentrated pockets of renter vulnerability (social tenants, informal occupiers). Although Croatia has very high home-ownership (≈89.7% in 2019), the private rental sector (PRS) is disproportionately vulnerable: roughly 30% of tenants are among the most burdened by housing costs and at risk of poverty. Renting is usually described as insecure and often informal, exposing tenants to exploitation and short-term rentals have reduced long-term supply and driven rents up, producing very high burdens on household incomes. Furthermore, owner-occupied households may still be energy-poor because of low-quality building fabric, small pensions/low incomes or their inability to finance renovations; and national calls that require proof of legal ownership favour those owners who are document-compliant while excluding more precarious occupants.

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Tenants and multi-apartment building residents face problems related to governance and split-incentives: building-level renovation requires collective decisions and co-financing arrangements. Thus identifying and subsidizing vulnerable tenants within multi-apartment buildings is administratively very complex and currently a recognized gap. A key barrier in tackling energy poverty is also the split incentive, or so-called "landlord–tenant dilemma", since property owners lack motivation to invest in energy upgrades (since savings do not benefit themselves directly), while tenants cannot make such investments themselves. This misalignment sustains inefficient housing and heightens vulnerability of tenants, underscoring the need for policies that align with their interests.

As part of this research, we gathered a focus group consisting of decision-makers from Croatia including two members of ministries dealing with energy poverty, one member from Environmental Protection and Energy Efficiency Fund responsible for allocation of funds and a member of City of Zagreb administration as the only municipality with a programme for combatting energy poverty. A focus group flagged the difficulty of identifying vulnerable households within multi-apartment buildings and ensuring funding where needed. Because of this, granular tenure-disaggregated energy-poverty indicators (owner vs rent, social vs private rent, legalized vs informal occupancy) and building-level ownership patterns are required to design equitable instruments. Current reporting obligations (National Energy and Climate Plan - NECP) require monitoring of energy poverty, however the research and focus group strongly indicated that these data are not yet sufficiently disaggregated for tenure-sensitive policy design.

In Croatia, several measures and policies are currently in place or under development to address energy poverty, ranging from amendments to the Energy Efficiency Act, targeted building renovation programmes and municipal allocations for retrofitting city-owned housing to social-welfare transfers directed at energy costs and forthcoming EU-supported mechanisms such as the Social Climate Fund. These policies draw on national statistical indicators (such as the share of households unable to afford adequate heating) as well as EU-mandated reporting requirements like the National Building Renovation Plan. However, available data remain fragmented and insufficiently disaggregated by tenure or household type, limiting the precision with which interventions can be tailored to those most at risk.

The focus group with decision-makers pointed to certain gaps and limitations, emphasising that existing administrative and monitoring systems are fragmented across ministries and local actors; there is limited tenure- and household-level granularity in available energy-poverty statistics and monitoring of implementation. While the mechanisms stated above provide significant resources, they remain primarily grant-based and do not yet fully address structural barriers such as liquidity constraints of low-income owners, financing for collective renovation in multi-apartment buildings or protections for tenants who may bear the indirect costs of upgrades. Existing measures for tackling energy poverty do not explicitly integrate the dynamics of housing prices, despite the fact that rising housing costs significantly influence affordability and thus vulnerability. While policies aim to improve access to renovation funding across municipalities, they do not systematically consider whether large-scale investments might raise housing values and rents. This absence of anti-displacement or affordability safeguards points to a critical policy gap in linking energy-transition measures with housing-market regulation.

Overall, the most vulnerable groups in Croatia's energy transition include low-income households, elderly residents, social-welfare recipients, tenants in multi-apartment buildings, rural households reliant on polluting solid fuels and those living in unlegalized dwellings. These research results fully align with the available data related to vulnerable groups in energy transition elsewhere in the CSEE region. For these groups, the energy transition offers potential long-term benefits through lower bills and healthier living conditions but also poses certain risks, such as exclusion from funding due to legal or administrative barriers, increased short-term costs or exposure to rising housing prices in renovated areas. Addressing these uneven impacts requires

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careful policy design and targeted protections, but the absence of available data and documented anti-displacement materials is a notable gap in the research.

In the Slovenian case, planned and implemented measures couple building-level renovation and small-scale renewables (RSE) with social-policy safeguards and advisory/outreach services - underpinned by a 2022 Government Decree that codifies multi-dimensional criteria for identifying energy-poor households (material vulnerability, high energy burden, low building efficiency, unsuitable living conditions), mandates annual national assessments by the national statistical office (SURS), and is operationalized through rolling three-year action plans led by the energy ministry and delivered via the Eco Fund (Slovenian environmental public fund). Crucially, the current action cycle is executed through three dedicated Eco Fund calls for energy-poor households: (1) a 100% grant (up to €18,000) for single-family homes whose occupants receive social/child benefits, covering one or more measures (insulation, windows, heating, etc.); (2) a call for insulation/facade upgrades in multi-apartment buildings for eligible low-income households; and (3) a call for heating-system replacement in multi-apartment buildings. Eco Fund performs pre-works building assessments and pays contractors directly—removing the up-front cash barrier and increasing delivery fidelity. This legal-statistical-programmatic chain (Decree - SURS annual estimates - 2024-2026 Action Plan - the Eco Fund delivery) goes beyond Croatia's still-widening eligibility work by embedding identification/monitoring directly into law and implementation plans and by aligning them with concrete, enclosed, final stage financial distribution instruments.

Implementation mechanisms mirror Croatia's grants-benefits-outreach approach but are more integrated in practice, which is seen in: (a) targeted investment incentives through the Eco Fund for insulation, heating replacements and household-level RES - delivered via the three energy-poverty-specific calls noted above, with no prefinancing by households because Eco Fund pays suppliers; (b) advisory and outreach via a national counsellor network and local coordinators that help residents prepare applications (social-work centres have been trained and can proactively refer cases; regional performance varies - e.g., Prekmurje region distinguishes); (c) consumer-protection tools (e.g., disconnection bans and advisory services signalled in the NECP); and (d) monitoring and evaluation through SURS and ministerial reporting. However, while renovation programs are monitored, small in-home help programs (e.g., bulbs, basic kits) have historically had weaker monitoring.

In terms of financial instruments and scale, Slovenia also fixes the financing and results chain with quantified targets - 8,000 households supported and 573 GWh cumulative savings 2023-2030, backed by €33.8 m (2024-2026) and EU funds including the incoming Social Climate Fund (SCF; more than €300 m expected for 2026–2032), while the NECP earmarks a large household-oriented investment envelope. Relative to Croatia, this pairing of earmarked national allocations, EU-level SCF integration and clear outcome metrics represents a more fully specified delivery architecture plus a clearer "one-stop" operational model at the last mile.

A key disparity with Croatia lies in identification and targeting tools. While Croatia is expanding eligibility beyond narrow social-benefit categories, Slovenia already operationalizes targeting through annually updated SURS estimates and Decree-based criteria; the Action Plan then translates these inputs into program targeting and regionally organized outreach. The design choice to condition the 100% grant by established social/child-benefit status offers speed and administrative simplicity, but the sources from the Focus Association for Sustainable Development warn of two targeting risks: (i) under-coverage of the "poorest of the poor" who lack formal benefit status yet are energy poor; and (ii) occasional mis-targeting (households that should not qualify still receive aid). A revision of the Decree has been signalled to tighten targeting and reduce leakage while improving reach to the hardest-to-serve. This reduces the "policy-to-practice" gap that Croatia faces—especially in multi-apartment/tenant settings - by giving implementers a repeatable input (who/where/how many) each year, tied to a designated

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delivery body (Eco Fund), but it also shows Slovenia is struggling with inclusion/leakage compromises that Croatia will need to solve as it broadens eligibility.

What additionally distinguishes Slovenia, both vis-à-vis Croatia and as an EU-level best practice is mainstreaming vulnerable/energy-poor households into energy communities alongside consumer-protection tools in the NECP. It explicitly includes support for renewable-energy communities and the inclusion of vulnerable households, positioning community energy as a structural lever that can pair lower bills with social participation; national policy reviews list support for energy communities among best practices. From the implementation side, Focus Association for Sustainable Development sources note the dedicated incentive for involving energy-poor households in energy communities has not yet been launched; the ministry is debating the institutional channel, and civil-society actors are preparing recommendations to ensure the design is accessible (more than 100% support for the poorest) and protects tenants from post-investment rent hikes. This contrasts with Croatia's current emphasis on grants/transfers by situating community energy as a core, not peripheral, anti-poverty tool - with a live policy window to lock in design safeguards before scale-up.

Speaking about data profile and targeting focus, recent national estimates (SURS, 2024) indicate that around 7.3% of all Slovenian households are in energy poverty, with single, older (65+) - especially women - households among the most vulnerable (approximately 17.3% of energy-poor households). New microdata analyses point to tenure disparities (around 15% among tenants vs. around 5.5% among homeowners) - but measurement is hampered by a "grey" private-rental sector. The Focus Association for Sustainable Development sources emphasize that split-incentives are acute (landlords capture asset gains while tenants pay energy bills), and rental renovations are rare because units rent easily even when substandard. Slovenia's very high home-ownership (>95%) concentrates low-income, inefficient housing among older owners; succession/inheritance can shift renovation obligations to adult children, complicating uptake. Eco Fund may, in certain cases, support upgrades even where buildings are not fully legalized, so long as the works fit within the €18k cap - mitigating a barrier often seen in Croatia.

What is comparable to Croatia is that there are monitoring gaps, i.e. no indicators for summer energy poverty, and earlier gender-focused analyses have not been published, pointing to areas for statistical strengthening compared with Croatia's own data gaps.

Despite its advanced setup, Slovenia still reports stagnant short-term reductions, administrative complexity, regional disparities in outreach capacity, and monitoring/data gaps (summer energy poverty, small-measures tracking). The planned inter-ministerial body to coordinate social and energy policy has not yet been established, and informal information-networks envisaged in the plan have been slow to materialize - echoing Croatia's fragmentation concerns.

At the local level some municipalities co-finance heating costs (e.g., Maribor, Jesenice), but there is no systematic practice of local anti-energy-poverty plans, underscoring the need for stronger local pipelines and data systems. Both countries would benefit from simplifying application/verification, sharpening regional targeting, diversifying funding, and strengthening monitoring and evaluation and community engagement to ensure that measures actually reach the most vulnerable - with special attention to tenants in multi-apartment buildings and low-income elderly owners in inefficient homes.

Croatia and Slovenia both integrate a social dimension into energy-transition policy. However, Slovenia's model of the Decree - SURS - Action Plan - Eco Fund chain, with three dedicated energy-poverty calls (including a 100% advance grant up to €18k), and clarified financing (including SCF and NECP envelopes) deliver more precise identification/targeting and stronger final stage delivery - while live policy work on energy-community inclusion provides a pathway to EU-level best practice if designed for tenant protection, 100% affordability for the poorest, and strong outreach. These are actionable lessons for Croatia as it broadens eligibility and strengthens tenure-sensitive delivery.

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In the case of Serbia, which started the negotiation process for accessing the EU in 2014, we can trace gradual progress in addressing energy poverty through policy evolution, driven by EU alignment and domestic energy challenges. Key developments span similarly as in Croatia, from early awareness in the 2010s where the focus was put on protection schemes for people vulnerable to energy related costs to recent national strategic plans emphasizing renewables and defining energy poverty.

Serbia—along with other Western Balkans economies—signed the Sofia Declaration in November 2020. This move endorsed the Green Agenda for the Western Balkans and pledged commitment to enacting various measures outlined in the European Green Deal. The agenda's first pillar focused on climate, energy, and mobility, setting a target for signatory economies to pursue carbon neutrality by 2050. One key action for advancing the energy transition involves creating programs to tackle energy poverty.

In 2021 Government of Serbia formed the National Coalition for Reducing Energy Poverty, gathering relevant ministries, representatives of civil and international organizations. The Coalition adopted the definition of energy poverty which, and in 2024 the Energy Sector Development Strategy of the Republic of Serbia up to 2040 and the Law on Energy introduced the legal recognition of energy poverty. Besides the definition, within the Law it is declared that assessment of the number of households in energy poverty will be done by the Ministry in cooperation with the competent state authorities for social policy, health, statistics and other state authorities. Within assessment, criteria will be defined taking into account groups of energy, climate, social and health indicators and guidelines of the Energy Community Secretariat in accordance with the Treaty Establishing the Energy Community. Similarly as in the Croatian policy context, although the definition is deemed positive by the civil society organizations, its implementation still remains rather limited.

According to the data, heating is a type of energy use that accounts for 65% of total household energy consumption, or a quarter of all energy consumed in Serbia. 38% of households use local solid fuel space heaters - an extremely inefficient appliances, while an additional 30% of households use solid fuel boilers for heating their homes. Although it is most pronounced in the categories of households with lower incomes, solid fuel heating represents big importance for all categories of the population in Serbia affecting consequentially the environmental impact of these households.

The Government of Serbia finances measures to combat energy poverty through a mix of national budget, international loans, subsidies, and dedicated funds under its Just Energy Transition Plan and Integrated National Energy and Climate Plan (INECP) up to 2030. In the last five years (2020-2025), Serbia has pursued several funding initiatives to address energy poverty, primarily through EU pre-accession aid, international loans, and national plans tied to its Green Agenda commitments. These efforts focus on energy efficiency in households, subsidies, and just transition measures, though direct allocations specifically labelled for energy poverty are often embedded within broader energy and environmental programs. Key examples include EU grants for retrofitting public buildings and households, EBRD and World Bank-backed projects, and national subsidies during energy crises.

The EU provided EUR 240 million in non-repayable IPA funds (part of a EUR 325.2 million package through 2032) for energy efficiency, including measures benefiting households vulnerable to energy poverty, such as renovations in public buildings and promotion of efficiency programs. Additional EU and EBRD grants totalling EUR 8.5 million (EUR 4.5 million grant + EUR 4 million loan) target retrofitting at least 5,000 m² by 2027, aiding low-income areas indirectly through decarbonization and heating improvements.

Serbia's 2030 Just Energy Transition Plan, adopted around 2025, allocates EUR 75.4 million for social measures, including EUR 12 million for entrepreneurship incentives and EUR 60 million for industrial park upgrades to mitigate job losses from coal phase-out, which helps regions facing

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energy poverty. During 2018-2023 (overlapping the period), Serbia disbursed EUR 3.4 billion in energy sector support, peaking at 3% of GDP in 2022 to cover high import costs and maintain affordable tariffs for vulnerable households via reduced tariff mechanisms. UNICEF-supported programs from 2025 also fund household efficiency upgrades for energy-poor families.

The World Bank has also strongly supported Serbia's efforts to combat energy poverty through targeted loans and programs, often integrated into broader energy transition and clean energy initiatives over the past five years. These focus on residential efficiency, utility stabilization, and support for vulnerable consumers amid the energy crisis and coal phase-out. Key examples draw from regional Western Balkans programs and Serbia-specific projects.

The investment project financing 'Scaling-Up Residential Clean Energy (SURCE)' from 2022 amounting EUR 44,9 million, with additional financing in preparation, promotes clean energy adoption in households, directly addressing energy poverty by funding efficiency upgrades like insulation and heating improvements for low-income families. It builds on World Bank technical assistance to scale residential renewables and reduce vulnerability to high energy costs.

Following the First Serbia Green Transition Programmatic Development Policy Loan (DPL), approved by the World Bank in March 2023 (EUR 149.9 million) as the initial operation in a two-part series to advance Serbia's green economy reforms, the Second Serbia Green Transition Programmatic DPL was approved in 2025, supporting fiscal alignment with green policies, including measures for energy affordability and just transition that indirectly aid energy-poor households by stabilizing tariffs and funding social safety nets. It complements broader decarbonization efforts to mitigate impacts on vulnerable populations.

Using the example of disbursement of EUR 44,9 million through the "Clean Energy and Energy Efficiency for Citizens" project of the Mining and Energy and the World Bank which provides subsidies to households for the implementation of energy efficiency measures we analyse the shortcomings of measures addressing energy poverty in Serbia. These subsidies are provided to improve energy efficiency and sustainable heating in households and are disbursed by the Ministry via local governments as intermediaries who participate with their own budget reaching households and companies. EUR 44,9 million have been provided from a loan, while several tens of millions of euros will be provided by local governments in their budgets, with a goal to reach 50,000 households by the end of 2027. The project is implemented by the Ministry issuing one public call directed at local governments each year. Local governments apply to the call and those whose applications are accepted receive grants from the Ministry in the percentage amount of 50% to 70% (depending on the level of development and air pollution). The remaining amount up to the full amount is co-financed by the local governments from their budgets. Funded local governments then launch their own public calls for households (end users) in their areas to implement energy efficiency (EE) measures. Each participating local government forms an Energy Rehabilitation Commission to oversee these calls for subsidizing household EE and clean energy initiatives. Selected households get non-refundable subsidies from the local government ranging from 50% to 65% (based on chosen EE measure packages), with households funding the balance. Subsidies apply to predefined EE measures or set combinations, using a "first come, first served" application process. However, local governments are left to choose whether they want to aim the most vulnerable groups in the final allocation of funds.

This way, as stressed in the analysis of the civic sector, the design of the call directs the most public funds provided by the loan to those who can spend the most of the money available. The relative participation of citizens decreases as the requested amount and number of measures increase. In all local governments, the most public money went to a smaller number of beneficiaries who were able to allocate the most of their own funds. In the 2023 competition, 56% of all funds in the competition were allocated to the 33 local governments (LGUs) that received the most funds. These 33 units are home to 56% of the population in 56% of households. However, out of the 33 local governments, 27 are above the median in terms of the number of employees

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and 29 are above the median in terms of average earnings. This shows that the share of the group of local governments with lower incomes has not increased as planned by the project. In 2024, local governments were for the first time able to choose to apply for funds to be directed towards energy-poor citizens. Local governments opted to request 10 times more funds for citizens who are not energy-poor. 44 local governments opted to request funds for the energy-poor and 137 local governments for other citizens. The total public funds allocated in 2024 to support the energy-poor amount to ca. EUR 2 million, while the funds allocated to households that are not energy-poor amount to approximately EUR 16,2 million. In 2024, 137 municipalities participated in the distribution of subsidies, of which 44 municipalities had competitions targeted at energy-vulnerable citizens (where the subsidy goes up to 90% of the cost), which is an innovation compared to previous years. Some municipalities provide more funds than prescribed by the program and some have their own programs.

The problem of allocation of funds to the more affluent households is therefore very similar to the policies and implementation measures for combating energy poverty in Croatia.

Main Results

Our analysis shows there is a significant gap between national strategies and policies on reducing energy poverty and the effectiveness of the measures put in place. Following the main goals of the green transition, reducing energy poverty was included in the National Energy Climate Plan (NECP), Recovery and Resilience Plan and national legislation recognized the energy poverty within its energy policy in Croatia in the last 5 years. However, the implementation of these policies remain limited in scope and do not address the most vulnerable groups - low-income households, elderly residents, single parents, tenants, rural communities and those reliant on solid fuels. These groups therefore remain reliant on fossil fuels and cheaper energy sources due to the impossibility of funding renovations, while more affluent households benefit the funding schemes provided by the state and municipalities. This creates a twofold territorial bias which favours urban over rural areas, and furthermore affluent neighbourhoods over disadvantaged ones.

Although absent in our initial hypothesis, the research shows that civil society plays a crucial role as an intermediary between policy frameworks and end-users, as their advocacy and research highly influenced policy making regarding energy poverty in studied countries, and at the same time they maintain the contact with the most vulnerable groups, mapping their needs. Whilst their progress is evident within project-based collaborations (most often through EU-funded initiatives) the volatility of financial support and stable backing by the state remain striking, particularly given the essential functions CSOs perform. The findings suggest that CSO actors require more stable and substantial funding, which would serve not only the interests of vulnerable groups but also the broader objectives of the public authorities.

Whereas we find consistency in producing national strategies and plans in analysed countries, we find significant gaps in their implementation. One of the key issues is the lack of data regarding housing tenures and households living in unregistered homes that would connect socio-economic status with the territorial and technical data. This way the criteria for allocation of funds are excluding the most vulnerable groups thus reproducing inequalities. Main funding schemes remain dependent on the state, where ministries operate in a silos structure with scarce coordination between social and territorial sectors. This affects the way funding is allocated, often neglecting local and territorial specificities and needs. Finally, the effect of public subsidies in the area of energy efficiency and alleviation of energy poverty is not systematically monitored in an adequate manner which needs to change in order to effectively contribute to the fair and social energy transition.

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Discussion and Conclusions

Despite formal alignment with the EU's climate and energy objectives, the research finds that policies aimed at reducing energy poverty in the region often fail to confront its structural drivers. The existing frameworks tend to privilege property owners with the financial and legal capacity to access subsidies, as well as construction and energy service providers who profit from EU-backed schemes. Conversely, those most affected by energy poverty—low-income households, elderly residents, single parents, tenants, rural communities, and inhabitants of informal or unregistered dwellings—remain largely excluded due to restrictive eligibility criteria, informational barriers, and high upfront costs.

Croatia, Slovenia, and Serbia represent a spectrum of approaches to tackling energy poverty within the Central and Southeastern European (CSEE) context, where high home-ownership rates, aging housing stock, and reliance on inefficient solid fuels exacerbate vulnerabilities during the green transition. While all three countries have embedded energy poverty into national strategies - driven by EU alignment, such as the Green Agenda, National Energy and Climate Plans (NECPs), and forthcoming Social Climate Fund (SCF) - implementation reveals persistent gaps between policy ambition and on-the-ground impact. Croatia's measures blend technical renovations with social benefits but suffer from narrow eligibility and urban biases; Slovenia offers a more integrated model via codified criteria and dedicated Eco Fund grants; and Serbia's funding cascade through international loans and local intermediaries disproportionately favours affluent households. This discussion synthesizes these cases to highlight common structural barriers, divergent strengths, and actionable pathways forward, underscoring the need for tenure-sensitive targeting, robust data disaggregation, and anti-displacement safeguards to ensure equitable energy transitions.

A core commonality across the cases is the predominance of grant-based retrofit programs for energy efficiency upgrades - insulation, windows, heating replacements - coupled with monetary benefits, yet operational designs often exclude the most precarious groups. In Croatia, national calls for family houses explicitly link renovations to social protection, expanding beyond "guaranteed minimum benefit" recipients via vulnerability analyses. However, eligibility criteria privilege compliant owners, sidelining tenants, informal occupiers, vulnerable groups in non-legalized buildings, and multi-apartment residents facing split-incentive dilemmas. High home-ownership (89.7%) masks low renovation liquidity among low-income owners, while renters (30% overburdened by costs) endure informal markets and governance hurdles. Focus groups with Croatian decision-makers flagged administrative fragmentation and data gaps in tenure-disaggregated indicators, echoing broader CSEE challenges where NECP monitoring lacks granularity for tenant-sensitive policies.

Slovenia's framework stands out for its legal-statistical-programmatic integration: a 2022 Government Decree defines multi-dimensional energy poverty (e.g., high energy burden, low building efficiency), mandates annual assessments, and feeds into three-year Action Plans operationalized by the National Eco Fund's targeted calls. These include 100% grants up to €18,000 for social-benefit households in single-family homes, plus multi-apartment insulation and heating upgrades—bypassing upfront costs via direct contractor payments. Quantified targets (8,000 households, 573 GWh savings by 2030) and €33.8 million (2024-2026) plus SCF inflows provide a "one-stop" delivery model, outperforming Croatia's widening eligibility efforts. Yet risks persist: under-coverage of non-benefit "poorest of the poor," leakage to ineligible households, and unlaunched energy community incentives for tenants. Regional outreach varies, and monitoring gaps (e.g., summer poverty) highlight incomplete maturity, despite innovations like disconnection bans and counsellor networks.

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Serbia's trajectory, accelerated by the 2020 Sofia Declaration and 2021 National Coalition, culminates in 2024 legal recognition via the Energy Sector Strategy and Law on Energy, mandating vulnerability assessments. Funding draws heavily from EU IPA (€240 million), World Bank loans (e.g., €44.9 million SURCE for 50,000 households by 2027; €149.9 million First Green Transition DPL), EBRD grants, and Just Energy Transition Plan allocations (€75.4 million social measures). The "Clean Energy and Efficiency for Citizens" cascade—Ministry grants (50-70%) to locals, who subsidize households (50-65%, up to 90% for vulnerable in 2024)—mirrors Croatia's tiered model but amplifies inequalities. Civil society analyses reveal 2023 funds skewing to affluent local governments (56% to 33 higher-income units), with 2024 seeing €16.2 million for non-poor vs. €2 million for energy-poor citizens across 137 municipalities. "First come, first served" and local discretion prioritize bigger spenders, leaving solid-fuel dependent rural households (65% heating consumption) underserved amid coal phase-out risks.

These patterns expose systemic biases: channelling public funds to those able to co-finance, territorial urban-rural divides, and tenure blind spots. High ownership (>89% Croatia/Slovenia, similar Serbia) concentrates inefficient stock among low-income/elderly owners, while vulnerable renters face landlord-tenant misalignments—landlords reap asset gains, tenants bear bills. Rural solid-fuel reliance (38% Serbian households) compounds air pollution and health risks, unaddressed by urban-centric calls. Economically, crisis subsidies (Serbia's €3.4 billion 2018-2023) stabilize tariffs short-term but entrench fossil dependence without deep retrofits. Dual biases emerge: affluent urban owners benefit, displacing poorer rural/tenant groups, with no systematic housing-cost integration risking rent hikes post-renovation.

Discussion of strengths reveals scalable lessons. Slovenia's chain of disbursement of funds exemplifies precision targeting via annual data and no-prefinancing grants, reducing Croatia/Serbia's policy-practice gaps. Energy communities as inclusion levers—Slovenia's NECP mainstreaming with tenant safeguards - offer Croatia/Serbia a participatory alternative to top-down grants, fostering bill reductions via collective renewables. World Bank/EBRD loans in Serbia demonstrate catalytic scale, but require ring-fencing for vulnerable quotas. Croatia's municipal innovations (Zagreb program) and focus-group insights underscore local pipelines' potential, if harmonized nationally.

Critical gaps demand urgent reform. Data fragmentation—lacking tenure, gender, seasonal disaggregation—hampers equitable design; all cases need granular indicators (owner vs. renter, legalized vs. informal) per NECP obligations. Administrative silos (ministries, locals, funds) create inefficiency; inter-ministerial bodies must enforce coordination. Financially, grants dominate, ignoring liquidity constraints—low-interest loans, revolving funds, or 100% advances for poorest could broaden reach. Anti-displacement measures (rent caps, relocation aid) are absent, despite rising housing costs amplifying vulnerability. Vulnerable cohorts—elderly women, social tenants, rural solid-fuel users—risk transition exclusion, perpetuating health inequities and greenwashing critiques.

Civil society organizations (CSOs) emerge as crucial intermediaries between policy frameworks and end users, often compensating for institutional shortcomings through advocacy, outreach, and project implementation. However, their role remains precarious and under-recognized, constrained by short-term funding cycles and limited engagement from decision-makers. The findings suggest that the energy transition in CSEE is currently uneven, disproportionately benefiting affluent households and neighbourhoods while leaving vulnerable populations behind.

Ultimately, the study demonstrates that energy poverty in the region cannot be understood solely as a technical or welfare concern. It is deeply embedded in property relations, housing regimes, territorial inequalities, and governance structures. By exposing how energy renovation policies can inadvertently reproduce social inequalities, the research contributes to debates on eco-social state transitions and provides evidence for more inclusive and justice-oriented policy design in the context of Europe’s green transition.

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The analysis of Croatia's energy-poverty measures exposes the contradictions of a transition framed as socially just, yet operationalized through mechanisms that are, in practice, often exclusionary. The central finding is not the absence of social considerations-on the contrary, policy discourse abounds with references to vulnerable groups and distributive fairness-but rather the persistence of structural blind spots encoded in eligibility criteria, legalistic requirements and the governance of multi-apartment renovation. The very households most vulnerable to energy poverty often remain those least likely to access the benefits of the transition. This is a stark reminder that energy poverty is co-produced by the intersection of housing policies, property relations and uneven access to state support.

Empirically, this case study complicates the usual owner–tenant divide. High ownership rates do not necessarily guarantee access to energy-renovation benefits. Many owners lack the resources or documentation to apply. Tenants are even more disadvantaged, excluded from subsidies while facing eventual rent hikes and displacement in upgraded properties. Conceptually, this case shows the limits of treating energy poverty as an efficiency or welfare problem and available data remain fragmented and insufficiently disaggregated for tenure-sensitive policy design, limiting the precision with which interventions can be tailored to those most at risk.

Finally, the study shows that energy poverty cannot be addressed without a clear definition and systematic monitoring of how measures and funding affect the most vulnerable groups. Yet current frameworks remain complex, fragmented and poorly targeted, with limited data on tenure and household types. Without tackling these structural and informational gaps, policies risk staying incremental and selective. The EU-level instruments such as the Social Climate Fund provide an opportunity to improve the existing frameworks, but only if linked to palpable and measurable social outcomes at the national level, which are currently lacking. All things considered, the unresolved tension between ecological modernization and social protection makes the idea of a 'just transition' deeply contested in Croatia.

Recommendations

According to the research, the mechanisms needed to make energy transition in households available and affordable to the vulnerable groups are the following:

- high co-financing rates or full subsidies for vulnerable households,
- interest-free loans,
- administrative support and simplification (minimise bureaucracy),
- targeted and stable support to the intermediaries working directly with vulnerable groups such as civil society and other actors
- digitalisation of procedures,
- development of evaluation of measures and feedback mechanisms
- structural analysis of the most vulnerable groups and development of measures accessible to each of them
- data collection on the vulnerable groups that do not meet all legal and administrative requirements in collaboration with civil society actors
- targeted municipal tenders and municipal co-funding,
- support for energy cooperatives/turnkey services, crowdfunding and PPPs,
- distribution of low-cost measures (LEDs, draft-proofing, radiator panels),
- replacement ("old-for-new") schemes for appliances/heating,

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- support and further development of EPAH - Energy Poverty Advisory Hub using recommendations and further development of data collection

Further policy design should explicitly assess and mitigate renovation-led affordability effects, for example through: mandatory tenant protection clauses in building renovations, social housing expansion tied to renovation funding and monitoring of local housing-price effects post-intervention. To ensure the energy transition is accessible and affordable for vulnerable groups, a mix of mechanisms is needed: broadened eligibility criteria for support, fully subsidised renovation options for the poorest households, financing instruments that address liquidity constraints and tenant-protection measures in cases of building-level retrofits. Equally important are streamlined administrative procedures for occupants of informal housing and the integration of social and energy data systems to identify and monitor those most at risk. EU-level instruments such as the Social Climate Fund provide an opportunity to embed these safeguards, but only if linked to palpable and measurable social outcomes at the national level, which are currently lacking.

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1.15 Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study

Overview

This case study examines Dordogne in southwest France, where since 2018 the local government has transformed public food procurement by serving over 13,000 secondary school students daily organic, mostly local, and freshly prepared meals on site (Falvo, 2023). Despite growing attention to sustainable procurement frameworks, empirical evidence remains limited on how local authorities translate policy ambitions into systemic change. The Dordogne case addresses this gap, illustrating how food procurement can act as a vehicle for a green and just transition by integrating environmental, social, and economic goals within a unified governance model (Stein, Mariani, Caranta, & Polychronakis, 2024).

Sustainable public food procurement is increasingly recognized as a strategic lever for food system transformation (Sonnino, 2009). Within the European Union, the Farm to Fork Strategy and Green Public Procurement guidelines have created enabling frameworks, yet implementation varies widely (European Commission, 2020). Recent legal research highlights both opportunities and constraints in including small farmers in public procurement systems (Andhov, Kania, & Mikulic, 2024). This case thus contributes to the growing body of research on how local authorities operationalize sustainability mandates within just transition frameworks linking environmental integrity and social justice (Newell & Mulvaney, 2013).

By bridging the gap between national policy ambitions and local implementation, Dordogne's experience highlights the importance of territorial governance and inter-institutional cooperation. The transition reconfigured relationships between producers, caterers, schools, and authorities, building a food system grounded in trust, transparency, and shared accountability. Political commitment, participatory management, and continuous staff training proved essential to embedding sustainability into everyday practice. Dordogne offers a living example of how public procurement can catalyze socio-ecological transformation through strong local leadership and collective values of justice and resilience.

In contrast to conventional models favouring large suppliers of standardized, low-cost foods, Dordogne prioritizes food sovereignty, resilience, and equity. It supports small-scale organic producers through digital platforms like Agrilocal, reinstates on-site meal preparation, and reshapes the food system around local value creation and democratic governance. The initiative promotes environmental sustainability, strengthens public health, and advances social equity through fair pricing and decent working conditions. As Cécile Jallet observed, "It is not merely a food reform; it is a transformation of the territory through food" (Eating City, 2024). Council President Germinal Peiro echoed this vision: "This is not just about organic food. It is about how we organize our rural development, our health, our education, and our democracy" (Eating City, 2024).

Operating within both EU and French policy frameworks, Dordogne embodies the objectives of the European Green Deal (2019) and Farm to Fork Strategy (2020), which identify public procurement as a key driver of sustainable food systems. The Clean Industrial Deal (2025) and Common Agricultural Policy reforms (2023) further emphasize local production and sustainability. In France, the EGAlim Law (2018) requires that 50 % of products be sustainable

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and high quality, including 20 % organic food in public catering, while the Anti-Waste Law for a Circular Economy (2020) and the Climate and Resilience Law (2021) strengthen obligations to reduce waste and emissions. Dordogne not only meets these standards but exceeds them, positioning itself as a national and European benchmark for sustainable public food procurement.

Relevance to GreenPaths

- Project level: Demonstrates how green transition policies generate real-world trade-offs and co-benefits in public service systems.
- Sectoral level: Positions food procurement as a strategic entry point to operationalize the green and just transition.
- Case level: Shows how Dordogne balances costs and benefits across sectors and actors, offering transferable evidence for policy innovation.

Overall, the methodology illustrates that sustainable public procurement can function not merely as a compliance mechanism but as a transformative instrument advancing regional sustainability, social equity, and democratic governance.

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Research questions

This case study examines how sustainable public food procurement can drive social change, supporting the GreenPaths project's goals. It explores how local policies and governance translate green transition ideas into tangible social, economic, and environmental outcomes. Focusing on Dordogne, the study links procurement reform, social equity, and policy innovation, showing how local authorities embed sustainability in daily practices.

How do public food procurement practices affect social equity, particularly in terms of providing fair opportunities for marginalized communities?

This initial research question examines how public food procurement practices influence social equity, especially regarding fair opportunities for marginalized communities. From this perspective, the case investigates whether the Dordogne model has promoted inclusiveness and equitable redistribution of value, both for the final beneficiaries—such as students and families—and for upstream actors like farmers, artisans, and small businesses. In doing so, it directly relates to the GreenPaths goal of assessing the social impacts of green transition policies, illustrating how food procurement can serve as a tool for promoting equality and empowerment throughout the supply chain.

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What role does policy innovation play in facilitating the integration of green and just transition principles in public food procurement?

This second research question explores the role of policy innovation in advancing the integration of green and just transition principles into public procurement. Here, the focus shifts to the institutional and regulatory aspects of reform—how new governance mechanisms, procurement models, and digital tools have supported the mainstreaming of sustainability and equity criteria in local decision-making. This aspect contributes to GreenPaths' broader research goal of understanding how local governance innovation can make the green transition more effective, participatory, and socially grounded.

Besides two core research questions, several sub-questions guide this investigation. The first examines how procurement policies influence students' diets, nutritional quality, and overall health outcomes. The second evaluates the economic impacts on local farmers, focusing on income stability, market access, and employment. The third explores which policy interventions most effectively support small and medium-scale suppliers, identifying transferable best practices. Another question investigates how sustainability criteria and menu planning strategies affect food waste generation in school canteens, reflecting both environmental efficiency and behavioural change among students and staff.

In addressing these questions, the study also draws comparative insights from Dordogne and other international experiences to inform future European public food policies, thus broadening the analytical scope of GreenPaths. The aim is not only to assess a single successful case, but to derive policy-relevant lessons on how integrated food governance can drive the green and just transition across diverse territorial contexts.

Together, these analytical lenses provide a comprehensive framework for assessing the social impacts of green transition policies and identifying mechanisms that promote equitable and sustainable outcomes at the local level. Variables such as access to healthy meals, farmers' income, procurement costs, food waste reduction, and governance performance offer an integrated perspective on aligning environmental and social objectives. The Dordogne case thus illustrates how transforming public procurement can advance the dynamics of the green transition—reducing inequalities, strengthening community resilience, and harmonizing local action with broader social and ecological well-being.

Methods

This case study applies a multidisciplinary analytical framework to evaluate the social, environmental, economic, and governance impacts of sustainable public food procurement in the Dordogne Department. Grounded in the GreenPaths conceptual and methodological matrix, the analysis explores how procurement policies interact with broader processes of social transformation and the green transition.

Conceptual Foundations

The analytical framework draws on five complementary disciplinary domains:

1. Environmental science: sustainability, carbon footprint reduction, biodiversity protection, pesticide elimination, and food waste prevention.

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2. Economics: local development, income generation for small-scale producers, cost-efficiency, and cost–benefit analysis.
3. Public health: nutritional epidemiology, food security, and dietary impacts on students' well-being.
4. Social sciences: equity in access to quality meals, gender and labour dynamics in school kitchens, and professional recognition of catering staff.
5. Policy and governance: public policy implementation, public procurement, regulatory compliance, multi-level coordination, and procurement innovation.

These domains were operationalised into indicator categories aligned with the GreenPaths analytical framework and suitable for comparative assessment across territorial contexts.

Data Collection and Analysis

The research relied primarily on qualitative methods, integrating semi-structured interviews and document analysis. A total of 20 semi-structured interviews were conducted with departmental officials, school managers, chefs, nutritionists, and representatives of farming networks. The first round took place in April 2024 within the SchoolFood4Change (SF4C) project; a second, in May 2025, was carried out under GreenPaths to refine insights on governance, cost structures, and supply networks. Triangulation of interview data with documentary sources enhanced validity by corroborating findings across multiple perspectives (Denzin, 2012).

Complementary data were obtained from policy and procurement documents, contracts, menus, and departmental reports (e.g., ECOCERT certification data, Agrilocal24 platform statistics, Manger Bio Périgord reports). A short documentary video produced within SF4C provided visual evidence of kitchen operations, logistics, and testimonies from farmers and catering professionals (Eating City, 2024).

Analytical Approach

The study combines cost–benefit evaluation with social impact assessment. Costs include financial expenditures, logistics, coordination efforts, and staff training. Benefits encompass environmental gains (emission reduction, waste prevention), public health improvements (dietary outcomes, food awareness), economic advantages (stable markets, local job creation), and intangible outcomes such as stronger professional identity and resilient territorial governance.

Findings and results

The Dordogne case study shows how local government can use public food procurement as a tool for fair, sustainable transition. Based on data, interviews, and documents, it explores Dordogne's shift in four areas: economic growth, environmental sustainability, social well-being, and governance. The strategy for 100% organic, local, and homemade meals benefits farmers, students, and communities, though it also entails costs, trade-offs, and hurdles.

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Local supplier participation and farmer livelihoods

The Dordogne program shifted sourcing from industrial suppliers to local producers, boosting local sourcing from 20% to 80%. Platforms like Agrilocal and Manger Bio Périgord removed barriers for small farmers, fostering fair competition and stable income. Dordogne's 6,500 farms, a third organic, are better integrated into the school food system, supporting sustainable investment and a resilient rural economy.

This shift redefined the relationship between public institutions and local agriculture, embedding food systems into territorial strategies. By connecting production, education, and community welfare, Dordogne shows how procurement can propel the green transition and generate value beyond food. These changes align with research on short food supply chains, which indicate fewer intermediaries improve farmers' returns while keeping prices competitive (Renting et al., 2003). Direct contracts stabilize income for small and medium producers (Low & Vogel, 2011), and local multiplier effects expand regional benefits (\son, 2009).

The following table illustrates the steady increase in the number of suppliers involved since the programme's launch:

Table 15. Table of suppliers involved in the Dordogne Programme

Kind of Supplier /Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Number of farmers since the launch:	**85**	**129**	**151**	**173**	**209**	**239**	**251**
Number of farmers who have delivered at least once since the launch:	52	76	88	98	110	122	127
Number of farmers who have been consulted since the launch	82	129	149	169	197	222	232
Number of artisans since the launch:	**16**	**23**	**26**	**29**	**30**	**31**	**35**
Number of artisans who have delivered at least once since the launch:	7	11	12	12	12	12	22
Number of artisans who have been consulted since the launch	13	18	19	21	21	21	14
Number of local businesses since the launch:*	**9**	**14**	**15**	**17**	**17**	**17**	**20**
Number of local businesses that have delivered at least once since the launch:	9	14	15	16	16	16	17
Number of local businesses that have been consulted since the launch	9	14	15	16	16	16	20
Number of other suppliers since the launch:	**6**	**8**	**9**	**13**	**17**	**18**	**18**
Number of other suppliers who have delivered at least once since the launch:	3	3	3	4	5	6	9
Number of other suppliers who have been consulted since the launch	4	4	5	9	11	11	16

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Market opportunities and economic resilience

The Dordogne experience shows how procurement can serve as a driver of local economic growth. By focusing on small and medium-sized suppliers, the program creates new market opportunities, diversifies income streams for producers, and strengthens local value chains. Public funds, instead of flowing into global agribusiness, are reinvested within the region. Mr. Demaison (Eating City, 2025) described this shift as an **'economic revolution,'** noting that school catering now brings in millions of euros annually for Dordogne's economy. Farmers who had never seen schools as potential clients now depend on them as reliable buyers. This resilience is not just economic but also social, helping to build community ties and solidarity between producers and schools.

The financial evolution of food purchases through Agrilocal underlines the substantial increase in value creation over time:

Table 16. Financial evolution of food purchases through Agrilocal

Year	Quantity (kg)	Total Value (€)	Organic Value (€)
2018	18,005	38,807.04	30,592.23
2019	30,708	85,272.52	67,228.54
2020	27,582	64,325.22	47,205.74
2021	63,255	168,733.66	134,167.08
2022	114,426	467,731.06	359,339.59
2023	60,639	259,389.66	196,650.78
2024	130,387	559,005.26	488,144.47

These figures confirm the growing economic impact of the programme, both in volume and in the increasing share of certified organic purchases, demonstrating how strategic procurement supports local and sustainable food systems.

Procurement cost management

Dordogne addressed affordability in sustainable procurement using tools like the digital software "À Table," designed by Aurélie Mansard, helping schools estimate needs and reduce waste. Strategies include splitting tenders into smaller lots to enable small producers' participation, fostering competition, and shortening supply chains. Internalized catering maintains in-house kitchens, controlling costs and preventing profit leaks, with investments in kitchens offset by overall comparable procurement costs. This shows sustainability can be budget-friendly through efficiency.

Environmental outcomes

Carbon footprint reduction

A key environmental outcome of the Dordogne program is the sharp reduction in food miles and related emissions. By sourcing nearly 80% of ingredients locally and optimizing logistics, the department has significantly lowered its carbon footprint. As Council President Germinal Peiro (Eating City, 2025) noted, shorter supply chains cut emissions and re-embed food systems in local

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territories, aligning with France's climate objectives and broader EU debates on climate-aligned procurement (Stein, Mariani, Caranta, & Polychronakis, 2024; Andhov, Kania, & Mikulic, 2024).

Organic farming and biodiversity

Providing 100% organic meals accelerated Dordogne's agricultural transition by guaranteeing stable demand for local producers (Eating City, 2025). With a strong organic base, school food policy catalysed further conversions. Eliminating synthetic pesticides and fertilizers improved soil health, biodiversity, and water quality (Peiro, 2025), while seasonal menus promoted crop diversification and resilience. Growth in certified organic farmland confirms measurable progress. Dordogne's place-based strategy aligns with scholarship on regional food systems (Marsden & Sonnino, 2008) yet, as Born and Purcell (2006) caution, localism alone is insufficient—success stems from coordinated, inclusive governance linking farming, education, and environment.

Food waste management

Food waste reduction has been a key achievement. The introduction of composting systems and the 'À Table' software to calibrate quantities has cut down on both over-purchasing and plate waste. Students are actively involved in awareness campaigns and educational activities, such as tasting brigades and garden projects, which help foster behavioral change. Nudging measures have also been introduced in cafeterias, such as offering 'low appetite' portions on demand and placing bread at the end of the buffet. These actions demonstrate how environmental outcomes can be achieved not only through supply chain reforms but also through cultural and educational interventions.

Social well-being and equity

Health and nutrition outcomes

The reform of school menus in Dordogne has demonstrated measurable health benefits for children. According to Aurélie Mansard (Eating City, 2025), meals now include less salt and sugar, more whole grains, and a greater proportion of plant-based proteins. Students are exposed to a wider variety of foods, which enhances dietary diversity and balance. These adjustments align with evidence indicating that nutrient-rich meals boost cognitive performance and concentration (Nyaradi et al., 2013). For many students, lunch remains the most important meal of the day, making its quality vital for health and learning outcomes. Cutting down on salt and sugar also supports long-term cardiovascular and metabolic health, consistent with findings by He and MacGregor (2008). Additionally, as Peiro (2025) highlighted, Dordogne's universal access to healthy, organic meals helps reduce socioeconomic disparities in diet quality—a connection well confirmed by research linking school meal programs to decreased inequalities in nutrition and educational success (Cook & Frank, 2008). Overall, the Dordogne model shows how menu reform, guided by sound nutrition science and principles of equity, can simultaneously improve child health, academic performance, and social inclusion.

Equity and inclusivity

Equity is central to Dordogne's approach. The programme ensures all children—regardless of socioeconomic background—receive nutritious, organic meals, helping reduce health inequalities. Procurement reforms foster inclusivity by structuring tenders to enable small and marginalised producers to compete, countering biases that favour large suppliers. This promotes fair access to public markets and redistributes economic opportunities locally. Food insecurity

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harms children's academic performance, behaviour, and health, but school meal programmes can improve attendance, attention, and learning (Kristjansson et al., 2007).

Dordogne thus demonstrates how embedding equity within procurement and nutrition policies can transform school meals into a lever for health, education, and social inclusion.

Professional recognition and job satisfaction

In Dordogne, canteen staff now prepare fresh, homemade meals rather than reheat pre-packaged food, boosting pride, motivation, and job satisfaction (Eating City, 2025). Improvements in ergonomics, training, and collaboration with farmers have improved health and working conditions. Roles now include co-developing menus and managing ingredients, reflecting a shift linking food prep to education, sustainability, and community well-being. This transformation highlights the social value of catering staff, emphasizing skill, autonomy, and recognition (Hodson, 2001).

Community engagement and food education

The Dordogne school meal project goes beyond providing food to include food education and community involvement through initiatives like tasting brigades, school gardens, and cooking workshops. These teach students about seasonality, sustainability, and healthy eating (Eating City, 2025). Parents and communities participate, emphasizing school meals as a shared social responsibility and regional cohesion tool (Eating City, 2025). This approach embodies food literacy, defined as "the scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and strengthen dietary resilience over time" (Vidgen & Gallegos, 2014). In Dordogne, food literacy is promoted through nutritional education and hands-on activities like gardening, cooking, and sensory experiences life.

Evidence from school programs shows experiential learning boosts children's willingness to try new foods, increases vegetable intake, and improves nutrition understanding (Ratcliffe et al., 2011). Ozer's (2007) review also finds school gardens improve dietary habits, attitudes, and environmental awareness, especially when incorporated into curricula and food services, a model successfully used in Dordogne.

Policy and Governance Innovations

Procurement reform and legal adaptation

Public procurement often favours large suppliers, excluding small farmers. Dordogne reverses this, using mechanisms like lot division, direct sourcing, and carbon criteria to make tenders accessible to local producers, complying with French and EU laws, including EGAlim and Climate laws (Eating City, 2025). This shows flexible policy and innovation can balance legal standards with sustainability and fairness, signalling political commitment to local resilience.

Legal frameworks both constrain and foster innovation in sustainable procurement. EU directives prohibit discrimination but allow sustainability criteria linked to the contract (Directive 2014/24/EU). Scholarship shows discretion in implementation, varying with contracting authorities' interpretations (Arrowsmith, 2010). Research highlights regulatory uncertainty and technical gaps as barriers (Testa et al., 2012); Dordogne's success reflects both supportive policies and institutional capacity to navigate legal complexity. Lot division—splitting large contracts—helps small suppliers participate while keeping bids competitive (Uttley, 1997).

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Support to local production and supply chains

Governance in Dordogne went beyond demand-side reforms, with the Department supporting local producers to meet public catering needs through organic conversion, collaboration with NGOs like Manger Bio Périgord, and digital tools such as Agrilocal24 linking small farmers to schools. These efforts improved supply reliability, built trust, and strengthened local agriculture resilience. Platforms like Agrilocal24, as publicly governed and embodying principles of platform cooperativism, promote inclusivity and local accountability, offering more democratic and equitable alternatives to commercial platforms.

Cross-sector governance, capacity building, training

The Dordogne reform was a territorial change beyond food policy, requiring coordination across sectors like education, agriculture, health, and environment. Nine departments and over twenty officers worked to align school catering with sustainability goals (Eating City, 2025). Building capacity for chefs, nutritionists, and staff—including menu planning, ergonomics, and sustainable cooking—was vital for institutional change (Eating City, 2025). Cross-sector governance is challenging in sustainability transitions. Ansell and Gash (2008) identify shared understanding, trust, and legitimacy as success factors.

Costs and Benefits

Dordogne's school meal project involves higher costs and coordination but offers long-term health, environmental, and economic benefits. With a yearly budget of €400,000–€500,000 for kitchen upgrades and extra funds for training and procurement, it demands more administrative time and labor for fresh meals (Eating City, 2025). Benefits include reducing carbon footprints, promoting organic practices, providing healthier meals, supporting local farmers, and fostering cross-sector collaboration focused on sustainable strategies.

Benchmarking the Dordogne Case Study with National (France) and EU Data

Policy and Legal Frameworks

France's legal framework promotes sustainability in public catering through laws like EGalim (2018), AGEC (2020), and the Climate and Resilience Law (2021), aligning with EU strategies such as Farm to Fork (2020). Despite these efforts, implementation varies, with some regions, like Dordogne, excelling by effectively integrating procurement, training, and policy to turn legislation into sustainable practices.

This table compares the Dordogne school food procurement model with national French data and broader EU sustainable public procurement insights from JRC (2024). and other research documents. It assesses key performance indicators (KPIs) related to food quality, sustainability, costs, procurement efficiency, and policy compliance.

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Table 17. Key Performance Indicators (KPIs) on food quality, sustainability, costs, procurement efficiency, and policy compliance

Indicator	Dordogne (Case Study)	France (National Data)	EU (JRC & Other Data)
Organic Share in School Meals	100% organic target (ongoing, many schools certified ECOCERT)	National target: 50% quality food, 20% organic (EGalim Law)	Varies (e.g., Sweden ~50% organic, Italy promotes local sourcing)
Local Sourcing	Priority on local products, using Agrilocal & direct contracts	National law encourages territorial food projects (PAT) but implementation varies	EU supports local sourcing, but regulatory fragmentation remains
Procurement Model	Decentralized at the school level, supported by department	Mixed: municipal/district-run or outsourced to private caterers	EU trend: hybrid models, some centralization for efficiency
Cost per Meal (Total)	~€8.4 (all costs included)	€7.63 - €10.40 depending on school size	Costs vary widely, often higher in Northern Europe
Parental Contribution per Meal	€2.74 - €2.99, with public subsidies	~€3.80 (median), varies by municipality	EU: varies (e.g., free in Finland, means-tested in Italy)
Procurement Framework	Public procurement, multi-supplier framework, adapted contracts	Public-private models, varied procurement practices	EU supports green & fair procurement, but enforcement differs
Food Waste Reduction	40-70g per student (low)	National avg: 135g per student	EU: ~120-200g per student, varies by region
Vegetarian Meal Offering	At least once per week, some schools daily	Required once per week by law	Increasing across EU, some daily options (e.g., Denmark)

Dordogne's school meals are 100% organic, costing about €8.40, with low parental contributions due to subsidies. Contracts with local farmers ensure supply stability in a transparent, multi-supplier system. Weekly vegetarian meals meet nutrition standards, and food waste is only 40–70 grams per student, well below typical levels. This shows sustainable catering is feasible without higher costs. The environmental impact of local sourcing is debated. Weber and Matthews (2008) noted transportation accounts for just 11% of food-related greenhouse gases, with production having a larger impact. Edwards-Jones et al. (2008) warned that claims of 'local food is best' depend on production efficiency. In Dordogne, short supply chains and organic farming likely reduce emissions through less transport and impact cultivation, aligning with broader sustainability studies (Notarnicola et al., 2017). Reducing food waste enhances the program's sustainability. Cohen et al. (2013) reported 120–150 grams of plate waste per student, while Dordogne's waste is less than half that

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Cost and Financial Aspects (Breakdown of Meal Cost)

Table 18. Comparative table of Dordogne, Francc, and the EU on cost components in public food service.

Cost Component	Dordogne (€ per meal)	France National Avg (€ per meal)	EU Trends (€ per meal)
Food Costs	€1.80 - €2.10	€3.12	Varies: €2.5 (Spain) to €5 (Sweden)
Personnel Costs	€4.00	€4.31	Higher in Northern Europe due to wages
Operational Costs	€1.55 - €1.73	€1.56	Similar across Europe
Total Cost per Meal	€8.4	€7.63 - €10.40	€6-€10+ depending on country

Dordogne's model shows that sustainability and cost efficiency can coexist. With an average cost of €8.40 per meal—within the French range of €7.63–€10.40—the program fully sources organic food and integrates locally without surpassing norms. Food costs (€1.80–€2.10) are below the national average of €3.12, due to direct contracts, fewer intermediaries, and waste reduction. This demonstrates that environmental and social goals can be achieved through smart procurement and management, not higher spending.

This challenges the idea that organic and local foods are more expensive. While organic products usually cost 10–50% more retail (Crowder & Reganold, 2015), institutions can offset this with scale efficiencies and transparent supply chains. Studies confirm that reducing middlemen increases farmer income without raising prices (Stevenson & Pirog, 2008). Cutting food waste—20–40% of costs in standard food service (ReFED, 2016)—also boosts cost-effectiveness, even with better ingredients.

Ultimately, Dordogne provides empirical evidence that decentralized, publicly managed catering can achieve financial balance while delivering superior environmental and social outcomes, redefining the economic logic of sustainable procurement.

Main results

The Dordogne case study demonstrates how local public food procurement, guided by a strategic and politically supported approach, can drive a green and fair transition. Implementing 100% organic, local, and freshly prepared meals in secondary schools has transformed procurement into a tool for sustainability, social equity, and resilience.

Environmentally, Dordogne's reform is impactful. Over 80% of ingredients are locally sourced, reducing food miles and emissions. Using certified organic products, verified by ECOCERT and supported by local initiatives like Manger Bio Périgord, has eliminated synthetic pesticides and fertilizers, enhancing soil health, biodiversity, and water quality. Food waste has declined due to

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behavioural nudges, student involvement, and tools like the À Table software for better portion control.

These results align with evidence showing organic agriculture's ecological benefits—reducing eutrophication by about 50%, eliminating pesticide contamination, and supporting 30% higher species richness—though effects vary by context. Institutional demand sustains organic transitions by providing stable markets that incentivize investment.

The program has created stable market opportunities for small and medium-sized producers. From 2018 to 2024, local suppliers through Agrilocal increased from 85 to over 250, directing more than €500,000 annually to farmers and artisans. These partnerships offer income stability, job retention, and support sustainable farming. Despite a shift to organic and local sourcing, food costs remain between €1.80 and €2.10 per meal—much lower than the €3.12 national average—thanks to direct purchasing and efficient cost management.

This aligns with research showing that reducing intermediaries in short food supply chains improves farmers' returns and keeps prices affordable (Renting, Marsden, & Banks, 2003). Direct institutional contracts help small and medium producers achieve income stability in volatile markets (Low & Vogel, 2011). Additionally, redirecting public procurement to regional suppliers generates broader regional benefits through inter-industry linkages and income circulation (Swenson, 2009).

The project has transformed school canteens into spaces that promote health and social inclusion. Menus now emphasize whole grains, legumes, and seasonal vegetables while reducing salt and sugar. These changes align with nutritional guidelines to improve children's diets and classroom performance. All students have access to high-quality meals, helping to combat food insecurity and inequality.

Additionally, school catering staff, who once only reheated pre-packaged food, now prepare and serve fresh meals as trained professionals, fulfilling a culinary and educational mission. A review of job descriptions shows that their roles have expanded to include fresh meal preparation and food education (Eating City, 2025). Ergonomic improvements and skill-building programs have increased job satisfaction and reduced physical strain, enhancing the status of catering staff in schools.

From a governance perspective, Dordogne's integrated strategy aligned education, agriculture, environment, and public health policies under a unified vision. Procurement practices were adapted to comply with EU and French laws, like the EGAlim Law, and made it easier for small producers through simplified agreements and platforms like Agrilocal. The Department also invested in training for cooks and procurement staff, supporting a cultural shift in public food service.

In conclusion, Dordogne exemplifies a sustainable school catering model that balances cost-efficiency, environmental responsibility, and social equity. It benefits local farmers, children, and kitchen staff, reducing reliance on intermediaries and industrial suppliers. This case demonstrates that strategic public food procurement can translate policy into practice, promoting resilience, health, and sustainability.

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Discussion and conclusions

Dordogne's case closely aligns with Greenpaths' vision of a just transition, where public procurement is used to develop a sustainable public food system. Dordogne's model supports one of Greenpaths' core hypotheses: holistic sustainable programs not only meet their goals but also generate additional benefits, whether social or environmental, without significantly raising costs. However, this case highlights that public procurement alone cannot produce these results; instead, political will, territorial coordination, and proper institutional design are essential for success. Nevertheless, it shows how holistic and integrated policymaking can be effective and efficient in creating more sustainable public food systems.

What is particularly striking about this case study is how Dordogne's council manages to source entirely organic, about 80% of local ingredients, and cook homemade, minimally processed meals while keeping costs within national and European averages (European Commission: Joint Research Centre, 2024). Their economic success lies in reducing intermediaries in the supply chain through local sourcing, improving bidding processes, and smarter planning of quantities using software, balancing sustainability with financial responsibility. While financial investment is crucial for transitioning to sustainable models, the Dordogne case shows that moving toward more sustainable food systems doesn't have to come with higher costs for local governments or families. In fact, this model allows funds to flow into the local economy: whereas public contracts once directed money to national distributors, they now circulate within the local economy. Between 2018 and 2024, the value of food purchases through the Agrilocal platform increased from €38,807 to €559,005, with the organic portion rising from €30,592 to €488,144. This trend illustrates a 'territorialisation' of public expenditure: funds spent on school meals now support local farms, artisans, and businesses. For small producers, these contracts provide income stability and a guaranteed market, which are vital during times of price volatility and market concentration. Demaison described this redistribution of public spending as an 'economic revolution' for the department, while Sees highlighted its role in fostering farm resilience and organic conversion (Eating City, 2025).

Thus, the Dordogne case challenges the status quo: contrary to the belief that strict public procurement laws limit local flexibility, Dordogne demonstrates that legal frameworks can serve as catalysts for innovation when used strategically. The department's procurement officers utilized several mechanisms allowed under French and EU law to align contracts with sustainability and equity goals. These included dividing tenders into smaller lots, incorporating environmental and social criteria, and using pre-market consultations to help small producers bid competitively. The digital platform Agrilocal played a key role in facilitating this shift. By directly connecting schools with local producers, it made transactions easier, promoted transparency, and significantly reduced administrative workload. The platform's success highlights how digital tools can connect small suppliers with public institutions, embodying the best practices outlined in the Farm to Fork Strategy.

Furthermore, Dordogne's reform provides an example of successful integrated governance and policymaking (Nilsson et al., 2012, p. 396). Nine departmental divisions were mobilized, linking agriculture, education, health, environment, and social services. Coordination tools such as the À Table software, procurement templates, and ergonomic kitchen guidelines standardized sustainable practices across schools, ensuring policy consistency. This organizational structure transformed sustainability from an isolated effort into a shared institutional culture. As Jallet noted, building a 'common language' among departments was one of the most essential elements

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of success, enabling coherent policy development (Eating City, 2025). Another factor in their success is policy flexibility. Dordogne's officials saw the current legal framework, such as the EGAlim Law (2018), the Anti-Waste and Circular Economy Law (2020), and the Climate and Resilience Law (2021), not as strict mandates but as frameworks that encourage experimentation. By aligning local initiatives with national and EU goals, especially the Green Public Procurement guidelines and the Farm to Fork Strategy, the department went beyond minimum requirements, establishing itself as a leader in implementation. Governance innovation often depends less on new legislation and more on creatively utilizing existing legal tools.

By surpassing minimum requirements, Dordogne's food policies greatly boosted both environmental and social well-being without significantly increasing costs. Environmentally, the benefits include lowering the carbon footprint, reducing waste, safeguarding biodiversity, and encouraging circular practices. Food miles are notably decreased by sourcing 80% of the food from local farmers. Since all purchased food is organic, it enhances soil health and promotes its regeneration by avoiding pesticides. Reorganizing logistics with local suppliers also cut packaging waste and refrigeration needs. Food waste management exemplifies these improvements: before reforms, food waste and over-purchasing were common issues in large-scale catering. Introducing planning software like 'À Table' allowed kitchen teams to adjust portion sizes. Along with composting initiatives and behavioral nudges—such as offering 'small appetite' portions and repositioning bread at the end of the buffet—these strategies reduced food waste by 40 to 70 grams per student, compared to the national average of 135 grams and the European range of 120–200 grams.

Socially, providing universal and nutritious meals to students acts as a social equalizer, making dietary diversity and whole foods accessible to all, and reducing the intake of processed foods. They are also empowered with knowledge through engagement in gardens, tasting brigades, and participation in menu design, turning canteens into educational spaces: meals evolved from a necessary service to an educational act enhancing climate awareness and sustainability amongst the youth. Regarding the kitchen staff, they are empowered through upskilling and increased recognition for their work, increasing the sense of purpose in the workplace. Within the workforce, the reform elevated the professional status of catering staff. By moving to fresh, homemade cooking, the kitchen staff required new skills and opened doors for professional growth. Training programs, led by chefs Peignon and Varaillon, focused on implementing ergonomic work practices, and educating about food quality and menu design. The result was a renewed sense of pride and purpose among kitchen teams, who now see themselves as educators and ambassadors of sustainable canteens. Finally, local and organic farmers receive stable streams of income through contracts, with public funds supporting local farmers who tend to be excluded from regular public contracts.

Yet, the Dordogne case comes with trade-offs, both environmentally and socially. Amongst the environmental costs, small-scale shipments and logistics require higher energy and resource use. Additionally, increasing climate risks make the Dordogne system more vulnerable to shocks. Socially, there is still resistance from local suppliers who use conventional farming methods, as well as a few schools that resist the switch to Dordogne's practices. Additionally, such a model requires substantial public investment and carries high administrative costs. However, these costs are not fatal to Dordogne's success, and the benefits generated by this model outweigh them. These costs reveal systemic weaknesses that extend beyond Dordogne's case. For instance, resistance to switching to organic farming may stem from issues of profitability, with farmers being an economically vulnerable group (EU CAP Network, n.d.).

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This case also supports the idea in the literature about the co-benefits of an integrated policy. Dordogne's example demonstrates clear, interconnected benefits across four areas. As mentioned earlier, various environmental and social advantages work together positively. Practically, this means that a policy focused on improving one specific area can also positively impact other policy sectors. An example is sourcing food from local, organic farms. For instance, as previously discussed, promoting organic farming benefits the environment by eliminating pesticide use and improving soil health. It also provides social benefits by increasing farmers' income and giving students access to nutritious, healthy, and affordable food, regardless of their social background. There are other examples of these spillover effects, especially involving kitchen staff. Sourcing whole foods, as Dordogne does, requires trained kitchen staff to transform raw ingredients into meals. This approach differs from the usual method where cooks mainly reheat and portion frozen food and instead gives kitchen staff a professional identity and purpose (Eating City, 2025).

These examples show how these policies are interconnected in practice and should be linked in policy design. Therefore, Dordogne's case supports GreenPaths' holistic approach to the transition, which combines social and environmental cohesion while minimizing economic trade-offs. Studying this case revealed some unforeseen findings. One of the least anticipated but most significant findings concerns the professional recognition of groups often rendered invisible: canteen staff, cooks, and small-scale producers. The transition did not just change menus and procurement strategy; it restored dignity and centrality to those who prepare and grow the food.

This recognition led to increased motivation, pride in work, and greater system stability, demonstrating that social justice is not an accessory but a fundamental part of sustainability. Another unexpected finding is that the costs of the transition cannot be measured solely by financial metrics. While investments in food budgets, kitchen renovations, and procurement systems were substantial, an equally important cost was in institutional capacity: redistributing work, time, and responsibility among staff and departments. Kitchen workers experienced more labour-intensive routines when preparing fresh and organic products; procurement officers had to develop and oversee more complex contracts; and administrators needed to coordinate continuously between producers, schools, and NGOs to ensure reliable supply chains. An additional layer of cost involved cross-departmental collaboration: connecting education, agriculture, health, and environment required ongoing negotiation and alignment of goals, often stretching existing capacities. These pressures do not always appear as immediate expenses, since some costs were absorbed through reorganization, staff training, and efficiency improvements. However, they represent hidden challenges: increased effort, more time, and sometimes greater stress for those involved.

The Dordogne case demonstrates that the "price" of the green transition is not only measured in euros but also in human effort and organizational resilience. Recognizing both aspects is crucial for creating policies that are sustainable in practice, not just on paper. Contrary to the common belief that public procurement law, at both European and national levels, acts as a barrier to sustainability, the Dordogne case shows that existing legal frameworks can be used creatively. Tools such as lot division, pre-market consultations, simplified e-procurement platforms, and environmental criteria were employed proactively, transforming legal rigidity into a catalyst for change. These challenges prevailing narratives and indicates that local institutions can "play the long game" by using procurement law as a facilitator rather than an obstacle. An unexpected insight concerns the civic and cultural importance of school meals. Lunch was viewed not merely as a service but as a space for education, collective learning, and reclaiming gastronomic heritage. In this way, food became a tool for everyday democracy: students learned to connect what they eat with their environment, climate, and health. This form of civic learning broadens the scope of

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food policy well beyond the canteen, integrating it into larger processes of cultural and ecological awareness.

However, significant data gaps remain to be addressed. This case study does not provide data on the long-term outcomes regarding the supposed health improvements of their new diet at school. However, several existing studies analysing the impact of healthier diets on children show an improvement in their overall health (Center for Disease Control and Prevention, 2024). Therefore, even if it does not allow us to make any inferences nor establish causality, these studies provide an optimistic outlook on the improvement of children's health. Additionally, there is a lack of systematic assessments of the economic benefits of ecosystem services, such as data on pesticide elimination and biodiversity protection. However, the effects of pesticides on soil health and biodiversity have been largely documented, therefore suggesting the beneficial effects of their removal in this case. Moreover, data about the costs of replicating these models in larger urban areas remain anecdotal. All these gaps highlight possible avenues for further research to build on and expand Dordogne's innovative approach.

To summarise, the main strength of the Dordogne case lies in its ability to foster sustainable policies without significantly raising costs. It adopts an integrated approach to policymaking, not only leveraging public procurement to implement sustainable public food systems but integrating agricultural, social, educational and environmental features into a coherent framework. While complying with laws, it uses them creatively to advance sustainable goals. By design, public contracts invest in the local economy, providing stable income for local farmers. It also builds stronger community ties between farmers and consumers, as well as improving children's health and awareness around environmental issues. However, Dordogne's model hinges on political will, which plays a determinant role in the success of the policy, which may not necessarily be present nor easy to mobilise. Additionally, this model bears significant administrative costs, which may not be borne easily by administrations with fewer resources. Moreover, shifting from industrial to home-made meals requires increased labour from kitchen staff: while the case of Dordogne suggests increased job satisfaction and professional recognition, it also highlights how such a model requires for substantial investment, as well as in training and support.

Recommendations

Leveraging the Dordogne Model for Greater Green Transition Impact

The Dordogne case provides lessons for European regions and institutions on implementing fair, sustainable transition via public food procurement. By aligning social, environmental, and economic goals within a clear policy, the Dordogne model shows sustainable change is achievable and replicable. Recommendations here are based on core findings supporting GreenPaths project's goals.

1. Strong Political Commitment and Cross-Sector Coordination Are Essential

Political leadership played a key role in initiating and sustaining the transformation (Eating City, 2025). Local authorities should view school catering as a strategic asset for regional development rather than merely a service. Cross-sector governance involving agriculture, education, health, and environment was crucial. Dedicated interdepartmental teams ensured policy consistency and helped turn sustainability goals into everyday practice.

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2. Make the Cook Profession Central to the Transition

Transforming school kitchens into centers of fresh food preparation requires more than investment; it needs a cultural and professional shift. Mouillac and Varaillon observed staff motivation increased when cooks were trained, upskilled, and involved in menu design and food education. Creating ergonomic workspaces and recognizing cooks' roles through fair wages and job security are essential for sustaining the transition.

3. Use Procurement as a Strategic Lever, Not Just a Compliance Tool

Dordogne has demonstrated that procurement can be restructured to benefit local farmers, even within EU and national legal frameworks (Eating City, 2025). Suggested strategies include dividing contracts into smaller lots to support small-scale producers, using digital platforms such as Agrilocal for greater transparency and access, adding environmental and social criteria—like carbon footprint and organic certification—in tenders, and holding pre-bid consultations to help build capacity among producers.

4. Foster Local Economic Resilience Through Targeted Public Spending

Schools now source 80% of their food locally, reinvesting millions into Dordogne's economy (Eating City, 2025). Local farmers benefit from predictable demand and fair prices, which increase their income stability and motivate agroecological practices. Public funds should be viewed as economic stimulants for local communities, not just service costs.

5. Embed Education, Sustainability, and Inclusion in Meal Delivery

Nutrition improvements, like reducing sugar and salt and increasing whole grains and vegetables, boost student well-being and focus (Eating City, 2025). Activities such as school gardens, tasting brigades, and participatory menu planning improve food literacy and promote lifelong healthy eating (Eating City, 2025). Universal access to quality meals reduces inequalities and ensures no student is excluded from healthy food due to family circumstances income.

6. Adapt and Harmonize Policy Frameworks to Support Local Action

Promote subsidiarity in school catering by transferring responsibilities and resources to local authorities. Standardize green procurement standards across the EU to support cross-border collaboration and sharing best practices. Consider updating national priority rules to allow food trade between border regions, strengthening territorial food sovereignty.

7. Invest in Monitoring and Evaluation Mechanisms

Local procurement agencies or observatories could assist with data collection, indicator monitoring, and ongoing learning. Transparent benchmarking (e.g., food waste per student, % organic, % local sourcing) allows for evidence-based scaling and accountability.

By utilizing these actionable insights, other regions can tailor the Dordogne model to fit their own unique institutional, cultural, and economic contexts. Importantly, the case shows that sustainable school meals are not just a policy goal but a real and powerful tool to build resilient, fair, and environmentally sound food systems across Europe.

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2 Discussion paper. "Reflection on GreenPaths case studies: identifying impacts of just transition policies in the EU and Global South"

Context

The GreenPaths project has developed 15 case studies to evaluate the social and environmental impacts of just transition policies in diverse contexts. Due to the geographical, sectoral, methodological, and conceptual diversity of these cases, it is challenging to establish a systematic comparison that yields clear conclusions. The Analytical Framework (D2.4) and the Conceptual and Methodological Matrix (D3.1) were designed to help align the case studies and were already used throughout the execution of T3.2 ("Carry out a set of 15 case studies") and thus, in the production of contributions for D3.2 and D3.3.

To address the diversity of results, an internal webinar was organised, aimed at identifying common patterns or specificities linked to sectors or cases, as well as insights that can inspire the redesign and improvement of just transition policies. The purpose of this session was to invite reflection and discussion in an argumentative, critical and open tone, and the outcomes led to the present discussion paper.

The webinar and the corresponding discussion paper contribute to the alignment of case-study questions and the overarching project questions, inspired and guided by the Analytical Framework (D2.4). This exercise aims at improving the coherence and quality of the inputs generated for subsequent stages of the project, especially in what concerns the co-design of green transition pathways (WP5).

Methodology

The case study webinar took the form of an online roundtable in two sections. Given the number of partners and cases, 11 participating case studies are divided into two groups (broadly done so through connecting the key concepts of the case studies)[10].

Group 1 was composed of the following case studies:

- Case study 1: Lithium mining in Barroso, Portugal
- Case study 3: Coal mine and thermal power plant closures in the region of Bierzo-Laciana (Spain)
- Case study 9: How 'just' is the 'just transition'? A regional analysis of climate finance in the European Union
- Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South

[10] Cases 5 to 8 regarding green industrial policies in Latin America, Southern Africa, Southeast Asia and North Africa, were not presented during the webinar. The TNI researchers responsible for the four case studies on green industrial policy in Global South regions had to travel to Brazil to participate in the climate summit (COP30) in Belém do Pará and were therefore unable to attend the webinar. However, the findings and conclusions of those case studies were considered in the production of this report.

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- Case study 12: Mining Lithium in Serbia

Group 2 was composed by the following case studies:

- Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania
- Case study 4: Common Agricultural Policy (CAP) on land use in Slovenia
- Case study 13: Green transformation of tourism industry – Case of Croatian urban tourist destinations
- Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study
- Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?
- Case study 14: Energy poverty in Central and South-Eastern Europe

Each group worked as a roundtable, led by a different discussant, with reflections on the case study findings prompted by 2 questions that are designed to a) align with GreenPaths central research and empirical questions and b) encourage cross-case discussion on the key findings of partners' diverse case studies. Each group of case studies reflected on the same 2 questions:

> Q1. *To start, let's return to the first GreenPaths guiding question: How are green transition policies impacting environmental sustainability and social wellbeing? Based on this overarching question, could you now elaborate on the specific social impacts—costs and benefits—that have been most evident in your case study?*
>
> Q2. *What are the primary challenges and most promising initiatives your case study identified regarding how different actors (e.g., local communities, the State, social movements, private companies, or the EU) responded to the socio-economic or environmental impacts of green transition policy? In your response, you are welcome to explore different aspects—depending on your main findings—such as governance and coordination issues at different scales, as well as initiatives related to mitigation, adaptation and restoration.*

The research questions of the case study were also a key reference to guide the discussion:

- *How do the proposed lithium mining projects impact the social and ecological well-being of the Barroso region?*
- *How do forest conservation policies impact rural communities in Romania?*
- *How do Just Transition Agreements impact the social well-being of communities affected by the closure of thermal power plants and mining operations in the Spanish region of Bierzo-Laciana?*
- *How does the Common Agricultural Policy (CAP) contribute to the transformation of land use patterns, agricultural practices and rural livelihoods of small farmers in partner countries?*
- *To what extent has Spain's national development bank (ICO) targeted sustainable finance towards those regions in Spain that are most vulnerable to the green transition?*

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- *How do green transition policy interventions in the EU, such as the Environmental Policy Stringency Index, contribute to a just green transition in the European Union, i.e., in the countries in which these policies are implemented? How do green transition policy interventions in the EU contribute to a just green transition in countries in the Global South?*
- *How does the introduction of a hydrogen economy impact the distribution of wealth and social well-being of citizens?*
- *How are decarbonisation and energy transition EU policies impacting extractivist policies and practices in Serbia, with a focus on lithium extraction process being planned?*
- *What is the transformative potential for ecological transition of the tourism industry in Croatia, with focus on main urban touristic destinations?*
- *How do the planned measures in reducing energy poverty address the social dimension of housing? What is the relation of energy poverty of households in post-socialist countries in Central and South-eastern Europe to the ownership and tenancy structure?*
- *How do public food procurement practices affect social equity, particularly in terms of providing fair opportunities for marginalized communities? What role does policy innovation play in facilitating the integration of green and just transition principles in food public procurement?*

During the discussion, partners were encouraged to share their results and deliberations regarding positive and negative social and environmental impacts, differences in the impacts for collectives and key stakeholder problematics as well as responses from actors to these impacts, and policy design issues at different levels. Reflections on opportunities, best practices or promising initiatives, primary challenges and future scenarios were also welcome.

Analytical Framework

The GreenPaths Analytical Framework was described in Deliverable D2.4 and it is designed to provide overarching guidance to and consistency with case study research around the impacts of green transition policy. The framework comprises key concepts, indicators, and tools. It also establishes overarching processes of social impact associated with green transition policy and identifies three conceptual tiers that link together the purpose and aims of GreenPaths case studies.

1. Processes of Social Impact (cross-sectoral and holistic typologies that infuse the framework):

- **Injustice/Inequality:** This process focuses on poverty and vulnerability, looking at equity in the distribution of the costs and benefits of the transition, the recognition of the rights of affected communities, and participation in decision-making.
- **Loss and Damage:** Investigates non-economic and economic consequences, which may include impacts on mobility, life, species/biodiversity, heritage/culture, and health/well-being, among other elements.
- **Labour:** This process focuses on the dynamics of production/consumption, evaluating the quality of the employment generated, working conditions and changes in production and consumption systems within the transition.

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- **Mitigation/Adaptation:** Refers to strategies aimed at reducing greenhouse gas emissions (mitigation) and measures to adjust to the current and future effects of climate change (adaptation).
- **Recovery/Resilience/Restoration:** Assesses the capacity of social and environmental systems to recover from shocks, their long-term resilience, and restoration (regeneration) initiatives.
- **Governance/Policies:** This process examines the role of policies and governance, including management, and how the transition is articulated in terms of transparency and democratic decision-making.

2. Concepts. The framework is structured to draw a line of conceptual continuity from the broad project goals down to specific case study inquiries.

- *Project Concepts*: These articulate the core purpose of the project across diverse sectors.
    - Sustainable growth: innovation, digitalisation, nature-based solutions, circular economy, post/de/growth, green taxes
    - Decarbonisation (low carbon, net-zero, carbon footprint)
    - Eco-social State/ Public Services
    - Employment & Green Decent Work
- *Sectoral Concepts*: These distil the project concepts into specific sectors.
    - Fossil fuel phase out/carbon pricing, standard setting/green labelling
    - Renewables (energy/communities, law-energy demand), prosumership
    - Green finance (taxes/bonds/etc.)
    - Urbanisation: smart (et al.) cities & infrastructure
    - Green jobs/climate jobs, re-skilling/retraining
    - State aid (social assistance, public services)
    - Organic/Agriculture, agroecology
- *Case Study Concepts*: These articulate the specific and localized inquiries of the WP3 studies.
    - Phasing-out (nuclear, coal, thermal)
    - New Extractivism, green industrial policy, lithium mining; Raw Materials Act
    - Hydrogen economy
    - Sustainable finance: taxes, trading/emissions etc.
    - Sustainable urbanisation: residential energy, housing, tourism
    - Public food procurement, school food policy, nutrition
    - Green/Landgrabbing, conservation, green certificates, biodiversity protection, biosphere/wilderness reserves.

The framework serves as an ontological and epistemological foundation for approaching the case studies and the accompanying conceptual and methodological matrix (D3.1) guides the selection of indicators and methodological tools. Due to the overarching guidance and consistency provided by this framework, the discussion that took place during the webinar also tried to frame the impacts and reflections into the set of Social Impact processes.

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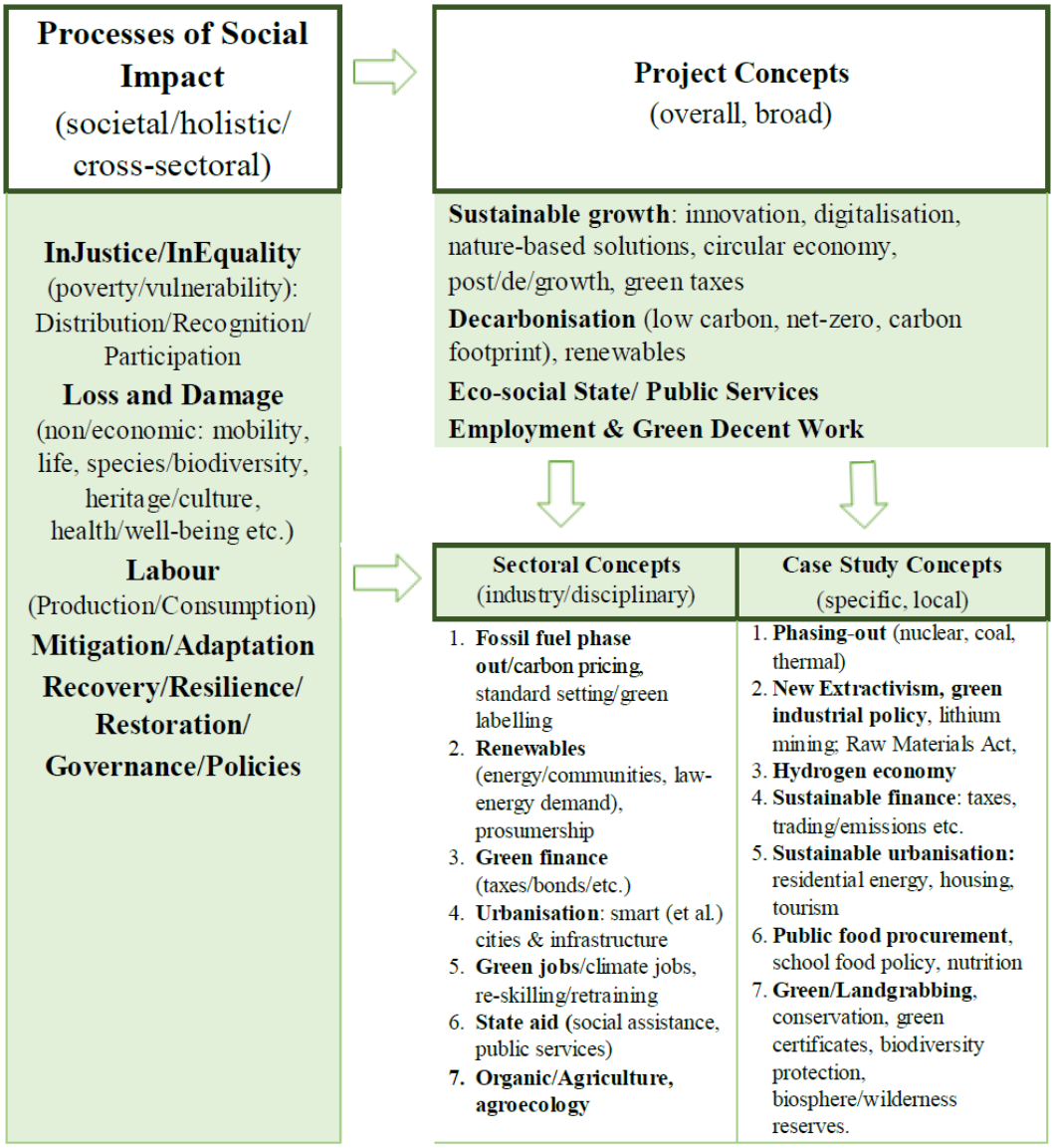
Figure 19. Impacts and Concepts of GreenPaths Analytical Framework (Extracted from D2.4)



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Summary

The green transition brings significant environmental benefits, such as emissions reduction, biodiversity protection, and ecosystem restoration, alongside potential social gains like job creation, energy security, and improved living standards. However, these benefits are often unevenly distributed and remain largely aspirational, while negative impacts are immediate and tangible. Key challenges include degraded public participation, governance fragmentation, and persistent inequalities affecting vulnerable groups and regions. Extractivist practices, "green grabbing" of land, and carbon leakage perpetuate global asymmetries, while precarious employment, rising costs, and social conflicts deepen injustice, foster fragmentation and endanger mutual trust. Methodological gaps in data collection and impact measurement further hinder accountability.

Promising initiatives aim to strengthen democratic governance and transparency through participatory mechanisms, legal reforms, and free, prior, and informed consent processes. Civil society mobilises through activism, litigation, and territorial defence movements, while innovative frameworks promote social dialogue. State-led strategies advance renewable energy and industrial capacity, complemented by technology transfer and skills training. Local initiatives, including sustainable public procurement and agricultural diversification, demonstrate socially inclusive models. At the international level, tools for the monitoring of climate funding and offshoring of emissions enhance financial transparency and mitigate carbon leakage.

Discussion

Overview of environmental and social wellbeing impacts

The environmental and social costs (negative impacts) and benefits (positive impacts) can be listed by case study or analysed according to the GreenPaths framework social impact typology. They can be also clustered by the types of sectors covered (Social Welfare, Equality, Employment, Accessibility and Inclusion; Food, Land Use and Agriculture; Finances and Industrial Production; Energy and climate). Furthermore, the discussion indicated that distinguishing strictly between environmental and social impacts, even useful, is not always meaningful, due to the overlapping and mutual connection between ´socioeconomic and socio-environmental impacts.

Positive impacts are predominantly focused on the environmental objectives of the transition, with notable social benefits when policies involve state planning and investment in human capital and social protection. They are mostly linked to **climate protection** initiatives derived from the reduction of emissions (GHG, especially CO_2) and to the **energy transition** processes and decarbonisation strategies taking place in Europe. Other benefits mentioned are related to **conservation and restoration**: Rewilding, protection of forests and biodiversity, and endangered species, restoration of ecosystems (e.g. former mining operations), lesser use of pesticides, and reduction of criminal logging.

Another category of advantages of just transition policies is linked to the **deployment of a 'green economy'** and are expressed in terms of both industrialisation and diversification, in a general context of renewable energy adoption. While the funding of environmental sustainability projects and the rise of circular economy initiatives are included as positive environmental impacts, more specific aspects include: the fostering of an agro-ecological economy, increasing sustainable practices in tourism and ecological restoration employment programmes. Consumers also perceive advantages like the promotion of public transport and the reduction of household energy consumption, based on improved building performance.

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These are also bound to **social and economic empowerment**, related to energy security and resource autonomy/sovereignty: reduction in fossil fuel imports and, in the case of critical mineral extraction projects, the reduction of dependence on imports of minerals such as lithium from outside the EU. Furthermore, potential benefits include the stabilisation of agricultural land, the creation of domestic value chains (wind/solar sector), the regional cooperation on climate adaptation and the technology adaptation to local contexts or the community-based conservation models.

Social benefits mainly stem from strategic planning, although they are often presented as promises or potential impacts. There is a trend towards strengthening state capacity for strategic planning and sectoral coordination, highlighting state-led development and industrialisation. References to positive impacts are commonly related to **material aspects** (economy, employment, wealth, quality of life, and development), including in most of the case studies references to economic prosperity, social development, job creation and improved social protection. There are, however, more specific allusions to domestic-oriented economic empowerment, support for farming activities (large facilities) and rural development, improved domestic access to energy or reduction of energy spendings, and improved housing quality.

Another category of positive impacts entails **investments for the long-term and future generations**, like the update of skills and training opportunities, including the improvement of public education and training. Technology transfer and sovereignty are also mentioned, exemplified in aspects like the transfers of knowledge on renewable technologies or the development of digital infrastructures. These factors contribute to a sound positioning in green global green value chains.

Policy and governance benefits are related to achievements in public participation and co-governance; improved strategy, coordination and planning, and policy innovation; empowerment of regional policy spaces; geopolitical significance and positioning; building of regional knowledge networks (interregional / transnational cooperation); and the strengthening of civil society engagement and awareness.

While positive impacts rely commonly on the *possible* effects of these policies (linked to 'long-term' effects and plans or 'potential' impacts, 'promises', and 'opportunities'), these are forthcoming scenarios, whereas just transition costs and risks are more tangible in the present or the near future.

Negative impacts can also be grouped into various areas, being the bad practices concerning **natural resources** one of the most discussed: pollution, water insecurity and contamination, soil degradation, loss of biodiversity, deforestation, and increasing human-wildlife interactions. There are also negative impacts derived from the conception of the environment or natural resources as an asset, which may influence the allocation of costs and benefits of their protection and exploitation, leading to: commodification of nature, overregulation of green areas, export-oriented extractivism, dependency on public funds for restoration (which may be considered inadequate or insufficient in some cases), and in general, relegating environmental protection to a secondary priority. In this group, it is crucial to highlight the problems related to **resources and land ownership or management,** and the power imbalances connected to them: green grabbing of lands (private and communal), foreign ownership of green industries, 'forest feudalism', land concentration, exclusion of small farms. reproduction of colonial patterns, and wild urbanisation. This commodification of natural resources shows a key connection between social and environmental impacts, and it is related to decision-making processes and interest conflicts that take place in the policy debates. Another cluster of negative impacts is composed by pitfalls of green industries, consequences of the adoption of green energies and effects of the implementation of a green economy in general. Here the displacement of pollution acquires a relevant role, in form of relocation of emissions or 'carbon leakage'. Other concerns relate to energy and resource management: an increased energy demand from industry, the intense

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consumption of resources (including energy), or the unequal access to renewable energy (vulnerable groups remain using fossil fuels).

Jobs and employment head the social negative impacts of just transition. Job creation is commonly referred as scarce or insufficient, and precarious (temporary, low-skilled). Moreover, even job loss is referred as one of the impacts of these policies. This leads to a loss of livelihoods and is worsened by another related issue: the disempowerment of trade unions. Income-related difficulties are relevant, since lower income groups are more adversely affected by climate policies in EU, where populations are suffering a rising pre-tax and post-tax income inequality. However, beyond income, other factors to be taken into account when considering **inequalities** include increased housing prices**,**living costs and energy poverty. According to the case studies, vulnerable groups are excluded from funding schemes and vulnerable regions are less developed and receive less finance. These territorial and regional imbalances (including urban over rural, affluent neighbourhoods over disadvantaged areas) contribute to the uneven distribution of burdens between and within countries. The persistent inequality outlined is connected to the previously mentioned power imbalances concerning land and resources ownership, and favours both private enterprises and politically connected elites.

Several **impacts on local communities** range from risks to traditional ways of life in rural environments (which include local culture and knowledges like those related to water management, farming, agriculture) to population movements (migration to more populated locations, 'renoviction', displacement of indigenous communities, etc.), through the deterioration of public services, misrecognition of indigenous rights, and resistance of local suppliers doing conventional farming.

Social negative impacts are to be explained, facilitated and worsened by **policy and sociopolitical relationships** mentioned along the costs of just transition: a low democratic perspective (degraded public participation, limited consultation, and lack of transparency), and social fragmentation (social conflicts and reduced mutual trust). Untargeted policies and an uneven climate finance are important factors to understand these dynamics.

In general terms, the negative impacts draw a pattern of 'green sacrifice' and distributional inequality, where environmental and social benefits are unevenly distributed costs are externalised to vulnerable communities or peripheral regions. Environmental benefits are being offset by localised ecological degradation, green grabbing and commodification of nature. These phenomena are facilitated by a situation where technocratic governance is sidelining democratic processes through limited community participation and transparency.

According to the GreenPaths framework, the impacts can be classified into the six categories mentioned previously (see Table 19). It is worth to highlight that 'Injustice/Inequality', and 'Loss & Damage' impacts are the most common types of undesired effects reported by the researched cases.

Table 19. Social and environmental impacts of the case studies by social impact process

Social Impact Processes	Positive impacts	Negative impacts
Injustice / Inequality	• Social and economic empowerment • Improved social protection • Better housing quality • Reduction in energy spending • Domestic-oriented economic empowerment	• Energy poverty and vulnerability • Exclusion of vulnerable groups from funding • Territorial and regional imbalances • Rising housing prices and living costs

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Social Impact Processes	Positive impacts	Negative impacts
		• Land concentration, "green grabbing", forest feudalism • Misrecognition of indigenous rights
Loss and damage	• Conservation and restoration of ecosystems • Rewilding and forest protection • Protection of biodiversity and endangered species • Preservation of cultural heritage through community-based models	• Loss of biodiversity and species Soil degradation and deforestation • Water contamination and scarcity • Migration and displacement of communities • Risks to traditional ways of life • Deterioration of public services • Health and well-being affected by pollution
Labour	• Job creation in green sectors • Employment programmes in ecological restoration • Skills development and training opportunities • Support for farming and rural development	• Job losses in traditional sectors • Precarious employment (temporary, low-skilled) • Disempowerment of trade unions • Increased resource and energy consumption
Mitigation / Adaptation	• Reduction of GHG emissions • Energy transition and decarbonisation • Technology transfer and sovereignty • Regional cooperation on climate adaptation	• Carbon leakage and relocation of emissions • Increased energy demand from industry • Unequal access to renewable energy for vulnerable groups
Recovery / Resilience / Restoration	• Ecosystem restoration • Strengthening community resilience • Long-term investments for future generations	• Dependency on public funds for restoration • Insufficient or inadequate restoration measures
Governance / Policies	• Improved strategic planning and coordination • Policy innovation and co-governance • Enhanced public participation • Building regional knowledge networks	• Lack of transparency and limited consultation • Social fragmentation and conflicts • Untargeted policies and uneven climate finance

In what concerns the **sectors**, only four categories were covered by the case studies ('Social Welfare, Equality, Employment, Accessibility and Inclusion'; 'Food, Land Use and Agriculture'; 'Finances and Industrial Production'; and 'Energy and climate'). The classification of the identified impacts by sector is shown in Table 20.

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Table 20. Social and environmental impacts of the case studies by sector

Sector	Positive impacts	Negative impacts
Social Welfare, Equality, Employment, Accessibility and Inclusion	• Social and economic empowerment • Improved social protection • Better housing quality • Job creation in green sectors • Skills development and training opportunities • Reduction in energy spending	• Energy poverty and vulnerability • Exclusion of vulnerable groups from funding • Territorial and regional imbalances • Rising housing prices and living costs • Job losses in traditional sectors • Precarious employment • Disempowerment of trade unions • Misrecognition of indigenous rights • Migration and displacement of rural communities
Food, Land Use and Agriculture	• Support for farming and rural development • Stabilisation of agricultural land • Agro-ecological economy • Community-based conservation models	• Land concentration, "green grabbing", forest feudalism • Soil degradation and deforestation • Water contamination and scarcity • Risks to traditional ways of life • Dependency on public funds for restoration
Finances and Industrial Production	• Domestic-oriented economic empowerment • Creation of domestic value chains (e.g., wind/solar sector) • Circular economy initiatives • Technology transfer and sovereignty • Industrial diversification	• Commodification of nature • Export-oriented extractivism • Increased resource and energy consumption
Energy and Climate	• Reduction of GHG emissions • Energy transition and decarbonisation • Improved building performance • Regional cooperation on climate adaptation • Renewable energy adoption	• Carbon leakage and relocation of emissions • Unequal access to renewable energy for vulnerable groups • Increased energy demand from industry • Overregulation of green areas • Pollution displacement

Certain topics appear both in the groups of positive and negative impacts (biodiversity/protection of species; job creation; public participation; farming support; access to energy). This may be related to the timespan of the impacts (e.g. job creation may be just a potential benefit). However, the fact that these negative and positive outcomes vary from one case study to other is also important to understand the impact divergence and contradictions. Moreover, the transversal effect of inequalities and the uneven distribution of impacts play a crucial role for the analysis of the just dimension of green transition policies.

When talking about positive and negative outcomes of just transitions, it is crucial to talk about distribution and balance. The uneven allocation of burdens and benefits, both between and within

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countries, undermines the positive sides of policies and worsens the negative ones. Offshoring of emissions is one of the most obvious reflections of this tricky pattern. In this sense, if both sides are to be compared, negative impacts may represent a higher weight, since a group can be deprived from the rewards of these policies while assuming a disproportionate burden. For this reason, it is crucial to think beyond a simple listing of impacts and ask ourselves: 'positive where?', 'positive for whom?', 'positive for how long…?'. Additionally, talking in terms of 'costs and benefits' may contribute to the commodification of both environment and human beings, since costs are factors that may be assumed or counterweighted, and calculated as a market value. A more complex context-based stakeholder analysis can contribute to understand the effects of policies in terms of 'winners and losers', in order to refine policies for a harmonised result[11].

Responses from actors: challenges and initiatives

During the webinar, participants were asked to identify the primary challenges and most promising initiatives identified in the case studies, regarding how different actors (e.g., local communities, the State, social movements, private companies, or the EU) responded to the socioeconomic or environmental impacts of green transition policy.

Primary Challenges

The main challenges identified in the case studies cover a wide range of structural, political and social issues that compromise the justice of the green transition, and many of them overlap across regions and sectors.

A recurring challenge is the **degradation of public participation** and the exclusion of communities in the consultation and approval phases of projects. Public participation and transparency are often seen as insufficient, as local communities rarely have a significant say in decisions about the future of their territories. Their concerns and oppositions are systematically ignored, especially in initiatives such as the hydrogen economy, where citizen participation is ineffective or limited to very late stages of the decision-making process. The policies are applied under a logic of urgency and geopolitical competitiveness, accelerating projects without substantive consultations. In addition, there is still a lack of recognition of the rights of local communities and their conservation practices, relegating them to a sacrificial role. This technocratic approach to transition leaves little room to consider those who are directly affected.

The persistent inequalities' **asymmetrical distribution of costs and benefits** are also a central issue, leading to the settlement and deepening of unfair practices. There is a marked unequal distribution of impacts, disproportionately affecting women, young people, lower-income population, rural areas, disempowered regions and territories, Global South countries, among others. Some of the factors identified are: a scarce and precarious employment (characterised by temporary contracts and low-skilled roles), pre-tax and post-tax income inequality, uneven climate finance (vulnerable regions and groups have more difficulties to access finance), and other factors like rising housing prices or unequal access to renewable energy. This specific challenge implies an additional difficulty: there are structural asymmetries that are transversal to all the socioeconomic structures, so they need to be analysed, understood and addressed with a more ambitious gaze.

The **reappropriation of resources** is also a common issue; since green transition processes often reproduce extractivist and colonial models, while the benefits are concentrated in elites or

[11] O'Brien, K. L., & Leichenko, R. M. (2003). Winners and Losers in the Context of Global Change. *Annals of the Association of American Geographers*, 93(1), 89–103. http://www.jstor.org/stable/1515325

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corporations. Instances of 'green grabbing' of land, including both communal and private areas, are increasingly reported, often justified through climate policies such as biodiversity protection or carbon credit schemes. There is also a growing risk of green reprimarisation in the Global South, where these regions are confined to supplying critical raw materials without achieving technological progress. Project benefits tend to be privatised while costs are socialised, with substantial public investments redirected to private actors. The extractivism of minerals essential for the green transition exacerbates water stress, soil degradation, and the displacement of indigenous communities. Furthermore, the outsourcing of EU emissions to less regulated economies in the Global South ('carbon leakage') undermines global climate effectiveness. Green energy export agreements also perpetuate asymmetrical North–South relations.

Political and administrative fragmentation and complexity hinder the implementation of fair policies, leading to **coordination and governance challenges**. Governance fragmentation hinders effective communication between EU, national, and municipal levels. This lack of coordination contributes to the limited scope of many measures, which often fail to address the needs of the most vulnerable groups, thereby exposing a significant gap between national strategies and their practical effectiveness. Moreover, the complexity of these policies makes them difficult for municipalities to interpret, discouraging companies and communities from active participation, worsening the uneven finance previously mentioned. In the agricultural sector, this challenge is compounded by the heavy administrative burden that ecological measures impose on small farmers. At the same time, certain industries—such as tourism—continue to resist systemic transformation, preferring to maintain a 'business as usual' approach. Underlying these issues is a persistent inability to reconcile economic growth with environmental and social impacts, a constraint that is further aggravated by ongoing legal conflicts and procedural obstacles.

Abrupt changes in policies and lack of transparency may generate **mistrust and social conflicts**. Trust in institutions has been eroded in some cases, largely due to political pressure to secure contracts and the failure to account for non-economic losses. This distrust is further deepened, for instance, when communities affected by mine closures, who had anticipated a gradual process, instead experienced abrupt and traumatic shutdowns, leading to widespread rejection of the policies. At the same time, a profound social conflict emerged between those who sold their land and those opposing extractive projects, creating significant social fragmentation within local communities.

Lastly, the difficulty in **measuring and tracking impacts** and financing is a methodological and policy obstacle. Data collection remains highly challenging, with large amounts of climate funds proving difficult to trace back to their actual investment locations. These gaps in information highlight a broader lack of political recognition of the problem, particularly when it comes to assessing the environmental and social impacts of sectors such as tourism. Compounding this issue is the absence of robust indicators to measure or evaluate critical forms of impact, including losses and intangible damage, which makes comprehensive monitoring and accountability even more difficult.

Promising initiatives

Interesting initiatives and actors' responses to the challenges of the green transition in the case studies manifest themselves at multiple levels, from community mobilisation and legal activism to innovation in governance and state-led industrial strategies.

Among the most promising initiatives stands out the goal of **strengthening governance and participation.** In the face of the frequent degradation of public participation and the dismissal of local concerns, various initiatives seek to ensure a fairer and more democratic process. In Spain,

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particularly in the context of coal mine closures in El Bierzo–Laciana, initiatives promoting public participation and co-governance have been identified, alongside proposals for participatory evaluation and enhanced corporate accountability. Improving legal and procedural transparency has also been emphasised, with calls to guarantee substantive democratic participation through processes such as free, prior, and informed consent (FPIC), ensuring communities have a legal and feasible right to reject projects. Furthermore, a reform of participatory mechanisms—specifically the Aarhus Convention—has been suggested to provide more effective tools for public involvement, as community voices are often heard only at very late stages of decision-making.

Regarding **social responses, mobilisation and slow justice,** communities, non-governmental organizations (NGOs), and activists have developed strategies to oppose negative impacts, often using legal and social tools. In response to the "slow violence" of environmental degradation, communities have increasingly turned to activism and litigation as tools for transparency and democratic accountability. In Romania, for instance, social mobilisation and conflict have been employed to challenge opaque practices, while slow justice processes—through litigation—remain essential for opposing environmental devastation. Similarly, territorial defence movements have emerged in Slovenia, affected by the Common Agricultural Policy (CAP), and across Latin America, where extractivism poses significant threats. These movements mobilise communities around specific risks, strengthen public awareness, and encompass anti-extractivist campaigns, environmental justice activism, and indigenous rights advocacy. In addition, civil society plays a pivotal role in advancing energy justice, particularly in addressing energy poverty in Central and South-Eastern Europe. Acting as an intermediary between regulatory frameworks and end-users, civil society fosters policy development and serves as a vital bridge between vulnerable communities and policymakers.

Another group of initiatives is linked to **innovation in industrial policy and state development**. In the Global South, in particular, government initiatives focus on strengthening state autonomy and capacity to lead the transition to local benefits. State-coordinated industrial strategies have shown significant potential for advancing decarbonisation and local development. In Latin America, renewable energy programmes in countries such as Uruguay and Costa Rica illustrate how state-led approaches can deliver both climate benefits and local value creation. Similarly, in North Africa, industrialisation strategies driven by the state have focused on building institutional capacity to support the transition. In Southern Africa, innovative just transition frameworks have emerged, notably in South Africa through mechanisms such as the Presidential Climate Commission, which emphasises social dialogue as a cornerstone of policy design. Complementing these efforts are initiatives centred on capacity building and technology, including public renewable energy programmes that generate employment, strategies for transformative beneficiation linking mining to manufacturing, and technical training schemes to strengthen job skills. A key priority in this context is mandating technology transfer as a condition for investment. Finally, in response to the growing threat of new extractivist projects—such as lithium mining in Serbia—advocacy initiatives call for non-extractivist policies that reduce dependency on resource extraction and promote alternative economic models, including degrowth and post-growth approaches.

Local and social economy proposals are also referred along the initiatives mentioned. Some case studies provided concrete examples of locally-based initiatives that manage to align social and environmental benefits. Sustainable public procurement offers a promising pathway for strengthening local economies and reducing social inequalities. A notable example comes from Dordogne (France), where public food procurement initiatives have reinforced local farming communities by improving working conditions and professional recognition for kitchen staff, reducing disparities in children's diets, and leveraging digital platforms such as *Agri Local* to ensure inclusive market access for small and medium-sized producers. In Slovenia, farmers have

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demonstrated resilience and creativity through agricultural diversification, embracing mixed production, local markets, and ecotourism as strategies to overcome barriers posed by the Common Agricultural Policy (CAP). Meanwhile, in Serbia, debates surrounding lithium mining have highlighted the importance of recognising non-economic losses and damages within governance frameworks, ensuring that intangible impacts are properly addressed in decision-making processes. In relation to economic aspects, allusions to diversification were also made, in order to promote a more resilient economy.

Finally, in what concerns **transparency of financing and regulation**, improvements in transparency in climate finance are brought by the European Investment Bank (EIB) through the EIB Tracker, a mechanism designed to address longstanding challenges in monitoring the location and allocation of climate funds. At the international level, the European Union has taken steps to mitigate the effects of 'carbon leakage' implementing legislation for the Carbon Border Adjustment Mechanism (CBAM), which aims to ensure a fair and effective global climate strategy.

Final conclusions and recommendations

The green transition offers environmental gains (such as emissions reduction and biodiversity protection) and potential social benefits, including job creation and energy security. However, these advantages remain unevenly distributed, while negative impacts like precarious employment, land grabbing, and social fragmentation are immediate. Governance gaps, degraded public participation, and persistent inequalities undermine the justice dimension of transition policies. Extractivist practices and carbon leakage perpetuate global asymmetries, while data and monitoring deficiencies hinder accountability.

Generating a comprehensive and timely understanding of the potential positive and negative impacts of just transition policies is crucial for their effectiveness to contribute not only to the purposes for which they were designed (a fair approach to climate and environmental challenges) but also to ensure their legitimacy and social acceptance. Beyond the global, local, sectoral impacts, or those linked to specific solutions (technologies or energy production alternatives), the transversality of inequalities and the asymmetrical nature of the effects of the green transition forces us to rethink the way in which these policies are understood. They cannot be conceived in isolation, but as part of a framework of policies with structural challenges that cannot be addressed only in terms of 'just transition'.

Green transition is characterised by multiple dualisms and power imbalances that separate people from nature, production from reproduction, in a capital-extractivism model of investor-ownership. The discussion emphasised the difficulty and danger of separating social and environmental impacts: separating human and non-human nature could contribute to the commodification of nature. Green transitions, as implemented, are characterised by dualities of power (global vs. local, urban vs. rural, Global North vs. Global South, sacrifice zones vs. benefited zones, winners vs. losers). In this sense, the separation of social and environmental impacts is seen as a reproduction of colonial and extractivist dualist thinking at the base of the capitalist system, where nature is considered exploitable, and justice requires analysing the conflict and interconnection between both aspects. Moreover, it is possible to envisage two realms which can be defined as 'institutional' or 'formal' spaces (strategies, actions, and decision-making linked to governments, banks, companies, etc.) and 'grassroots' spaces (perceptions, narratives, and options linked to workers, families, activists, etc.).

In what concerns specifically the dualism of Global North vs. Global South, there are some aspects common to both geopolitical areas (labour organising, job quality, ecological damages), but in general terms, it is possible identify specific impacts and trade-offs which occur more often

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in the geographic Global South. In the Global North, EU policies reduce emissions but exacerbate inequality. Meanwhile, in the Global South, green industrialisation risks reproducing extractivist dependencies and neocolonial patterns. Moreover, North-South asymmetries may be reinforced by carbon border adjustments and technology dependence.

Increasing the collection of information and the generation of knowledge is essential not only to improve just transition policies, but also to provide them with an in-depth reflection that helps to address different dimensions of justice (distributional, procedural, recognitional). It will also help to avoid biases when communicating and generating narratives on the long road to real sustainability. A multidimensional approach will help to avoid techno-optimist solutionism and narrow perspectives merely focused on the relationship between energy and climate.

It is essential to highlight the calls to improve the levels of participation and commitment of the affected communities, as well as the levels of transparency. While the starting point refers to a global community, both the effects of climate change and the policies aimed at combating it are unevenly distributed. Thus, the need for greater participation must be conceived in a complex way, with multiple layers, taking into account the complete maps of actors, the concept of 'agency', and the need to guarantee shared benefits. All this must be designed with realistic and acceptable timeframes that guarantee planning and strategies that are proactive and representative, not conditioned by emergencies and competencies that entail unnecessary damage.

Achieving just transitions requires embedding democratic governance, participatory mechanisms, and social safeguards into green transition policies. Policy priorities include:

- **Expanding just transition frameworks** beyond energy to encompass agriculture, finance, and conservation.
- **Addressing intersectional inequalities** by prioritising vulnerable groups.
- **Strengthen democratic governance** through participatory mechanisms and legal reforms.
- Enforcing **transparency and accountability** in climate finance via robust tracking tools and international measures
- Promoting **South-South cooperation** and **technology transfer** to counteract green colonialism.
- **Rejecting sacrificial logics** in favour of holistic approaches linking ecological sustainability with social wellbeing.
- **Promote state-led strategies** for industrial development, technology transfer, and skills training to maximise local benefits.
- **Support community-based initiatives** such as sustainable procurement and agricultural diversification.

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3 Dissemination based on the case studies

In order to maximize the visibility, impact, and dissemination of the insights and reflections generated through the case studies, the consortium partners plan to implement additional activities that build on these findings. Planned actions include the publication of case study-based research in high-impact journals, such as *Environmental Justice Journal* and the *Cambridge Journal of Regions, Economy & Society*. Moreover, partners have secured opportunities to present findings at major international conferences, including the *European Law Unbound Conference, the Annual Political Economy Conference,* and the *POLLEN Conference*, as well as specialized events like *The Greyzone of the Green Transition* in Romania. Several partners, such as CES and JLU, have scheduled presentations at leading academic institutions and research centres, including Milan University and the Wegener Center for Climate and Global Change. Collaborative efforts are also being fostered, with Policy Lab and UvA exploring joint outputs on energy justice, green industrial policy, and new extractivism. Beyond academic dissemination, targeted stakeholder engagement is planned through reports and discussion papers, notably by INTERMON, while regional outreach will be strengthened through publications addressing energy poverty in Croatia by PNG. These actions collectively ensure that project findings reach diverse audiences, from scholarly communities to policymakers and civil society actors, reinforcing the project's relevance and impact. The specific planned actions are detailed in Table 21.

Table 21. Dissemination actions based on the case studies

Partner	Case study	Dissemination actions
Zajednicko (ZAJEDNICKO)	*Case study 12: Mining Lithium in Serbia*	• Paper in a special edition of *Environmental Justice Journal* - Post-Socialist Environmental InJustice: Relational and Lived Experiences.
University of Cantabria (UC)	*Case study 9: Climate finance and its distribution in the EU*	• Publication in a leading journal, *Cambridge Journal of Regions, Economy & Society*. • The results of the case were also presented at World Economy Meeting (Madrid, May 2025)
Justus-Liebig-University Giessen (JLU)	*Case study 10: Effects of green transition policy interventions on environmental sustainability and social wellbeing in EU countries and in 24 selected countries in the Global South*	• Two papers written by Aimen Abbas and Thomas Kopp (JLU) derived from their case study on impacts of environmental policies' stringency. • Presenting results from the case study at a seminar at Milan University in January, 2026. • Presentation at the *Wegener Center for Climate and Global Change* at University of Graz in 2026.
Centro de Estudos Sociais (CES)	*Case study 1: Lithium Mining and the 'Green Sacrificial Logics' of the Energy Transition in Barroso, Portugal.*	• CES have presented findings from the case study at the *European Law Unbound conference* in Prague, September 2025 • CES will present the findings at the 9th *Annual Political Economy Conference* in Porto in January 2026

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Partner	Case study	Dissemination actions
		• Presentation at the *Political Ecology Network (POLLEN) Conference* in Barcelona in June 2026. • The article will be submitted to a scientific journal in early 2026. • CES are also working on a paper that brings in findings from additional case studies (e.g. new extractivism in Serbia through Zajednicko).
Centro de Estudos Sociais (CES)	*Case study 2: Europe's Yellowstone? An analysis of the social impacts of forest conservation in Romania*	• CES presented findings from the case study at the *European Law Unbound conference* in Prague, September 2025 • CES will present the findings at the *The Greyzone of the Green Transition – Environmental Inequalities in Central and Eastern Europe* conference in Romania in May 2026 • Presentation of findings at the *Political Ecology Network (POLLEN) Conference* in Barcelona in June 2026. • The article will be submitted to a scientific journal in early 2026.
Policy Lab (POLICY LAB)	*Case study 4: Assessing the Impacts of the Common Agricultural Policy (CAP) in Land Use in Slovenia, Croatia and Serbia*	• Specific publication ideas and collaborations will be discussed. Potential joint outputs with partners will be explored once priorities are clarified.
Pravo na grad (PNG)	*Case study 14: Energy poverty in Central and South-Eastern Europe*	• PNG are discussing with partner organisation (NGO) from Croatia on publishing the text on energy poverty in a Croatian scientific journal.
Universiteit van Amsterdam (UvA)	*Case study 11: The European Hydrogen Economy: A Carrier for the Green and Just Transition?*	• Writing of a publication on energy justice based on the work done in the case study. To be presented at a conference in Groningen (with options to be published afterwards). • The results were presented in a future of energy seminar and a workshop on energy justice at the UvA. • Considering collaborations on new extractivism with CES and on green industrial policy with TNI.
Oxfam Intermon (INTERMON)	*Case study 3: Just Transition Agreements – Coal mine and thermal power plant closures in the region of El Bierzo-Laciana (Spain)*	• Oxfam Intermon will be writing a short report/discussion paper with the results to be shared with authorities and other stakeholders

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Partner	Case study	Dissemination actions
Risteco la ville qui mange (RISTECO)	*Case study 15: Public food procurement as a lever to foster the just and green transition – Dordogne case study*	• Presented in Brussels at the EU Parliament in the occasion of a the presentation of *Journey Through the Europe of the Future*. • Presented in Nancy (France) at the *Rencontre nationale CNFPT de l'alimentation durable et de l'action éducative*. Closing session of Dec 17 • This case study will become a policy brief addressed to EU cities published in March 2026.
Transnational Institute (TNI)	*Case study 5: Green Industrial Policy and Ecological Transformation in Latin America: A Transformative Perspective;* *Case study 6: Green Industrial Policy in Southeast Asia: Developmental States, Export-Oriented Manufacturing, and the Paradox of 'Green' Transitions;* *Case study 7: The Paradoxes of Green Industrial Policy in Southern Africa*	• TNI will publish these case studies as "long reads" on the institute's website, with an attractive graphic layout and images. They will be online by February 2026. • Revised versions of these studies, reformatted as academic articles, are scheduled for submission to journals identified in January

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4 References

Case study 1

APA. (2024). Plano Nacional Energia e Clima 2030 / Portugal's National Energy and Climate Plan (PNEC 2030). Accessed 28/10/2028 from https://apambiente.pt/clima/plano-nacional-de-energia-e-clima-pnec

Associação Unidos em Defesa de Covas do Barroso, MiningWatch Portugal (2024) Lithium Mining in Barroso, Northern Portugal. Critical Factsheets on Mining projects, Bruxelles: European Environmental Boureau

Balcázar Morales, R., Djukanovic, N., Riquito, M., Velicu, I & Wuisan, L. (2025). GreenPaths Webinar: "How the lithium rush is producing sacrifice zones in Europe and beyond". GreenPaths YouTube channel: https://youtu.be/i-BTgVv3Xo4?si=_vCjXx_sYqkVKvLj

Barca, S., Hiraldo, R., Krause, D., Piccardi, E.G., & Stevis, D. (forthcoming) Just Transition and Care Work: An International Inquiry, UNRISD

Batel, S., & Küpers, S. (2023). Politicizing hydroelectric power plants in Portugal: spatio-temporal injustices and psychosocial impacts of renewable energy colonialism in the Global North. Globalizations, 20(6), 887-906.

Batel, S., Valquaresma, A., & Alba, M. (2024). Rural communities' energy metabolisms in Portugal: Between territorial injustices and far-right populism. Journal of Rural Studies, 111, 103425.

Boyd, D.R. (2023). Letter of complaint: public consultation process on the revised environmental impact assessment submitted by Savannah Resources PLC regarding their proposed Barroso mining project, and related human rights concerns. Human Rights Council, April 3, 2023. Ref.: AL PRT 1/2023.

Boyd, D.R. (2023). A/HRC/52/33/Add.1: Visit to Portugal - Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment. Accessed 28/10/2025 from https://www.ohchr.org/en/documents/country-reports/ahrc5233add1-visit-portugal-report-special-rapporteur-issue-human-rights

Brandajs, F. (2025). Advancing theories on the scalar complexities of Green Sacrifice Zones. Energy Research & Social Science, 127, 104180.

Brock, A. (2023). Securing accumulation by restoration–Exploring spectacular corporate conservation, coal mining and biodiversity compensation in the German Rhineland. Environment and Planning E: Nature and Space, 6(4), 2134-2165.

Bruna, N. (2023). The rise of green extractivism: Extractivism, rural livelihoods and accumulation in a climate-smart world. Routledge.

Carballo-Cruz, F., Cerejeira, J. (2020), The Barroso Mine Project - Economic Impacts and Development. Final report. Braga: University of Minho.

Carvalho, A., Matos, A. R., & Ferreira, V. (2021). Climate change, risk governance and grassroots movements: The case of the Transition Movement in Portugal. Citizens' Commitment in Risk Governance, 30.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Carvalho, A., Riquito, M., & Ferreira, V. (2022). Sociotechnical imaginaries of energy transition: The case of the Portuguese Roadmap for Carbon Neutrality 2050. Energy Reports, 8, 2413-2423.

Chaves, C., Pereira, E., Ferreira, P. & Dias, A.G. (2021). Concerns about lithium extraction: a review and application for Portugal. Extr. Ind. Soc. 8 (3), 100928 https://doi.org/10.1016/j.exis.2021.100928.

Conde, M., & Le Billon, P. (2017). Why do some communities resist mining projects while others do not? The extractive industries and society, 4(3), 681-697.

Cummings, S., De Haan, L., & Seferiadis, A. A. (2020). How to use critical discourse analysis for policy analysis: a guideline for policymakers and other professionals. Knowledge Management for Development Journal, 15(1), 99-108.

Delicado, A., Figueiredo, E., & Silva, L. (2016). Community perceptions of renewable energies in Portugal: Impacts on environment, landscape and local development. Energy Research & Social Science, 13, 84-93.

Del Mármol, C., & Vaccaro, I. (2020). New extractivism in European rural areas: How twentieth first century mining returned to disturb the rural transition. Geoforum, 116, 42-49.

Direct Industry. (2022). Lithium: What Are the Main Mining Projects in Europe? Accessed 28/10/2025 from https://emag.directindustry.com/2022/11/03/lithium-what-are-the-main-mining-projects-in-europe/

Dragi, M. (2024). The Future of European Competitiveness. EC. Accessed 28/10/2025 from https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

Dunlap, A., & Brock, A. (2021). When the Wolf Guards the Sheep: The Industrial Machine through Green Extractivism in Germany and Mexico. In Energies Beyond the State (pp. 91-124). Rowman & Littlefield Publishers.

Dunlap, A., & Riquito, M. (2023). Social warfare for lithium extraction? Open-pit lithium mining, counterinsurgency tactics and enforcing green extractivism in northern Portugal. Energy Research and Social Science, 95. https://doi.org/10.1016/j.erss.2022.102912

Dunlap, A., Verweijen, J., & Tornel, C. (2024). The political ecologies of "green" extractivism (s): An introduction. Journal of Political Ecology, 31(1), 436-463.

EAPN. (2024). Poverty Watch National Reports 2024. Accessed 10/28/2025 from https://www.eapn.eu/poverty-watches-2024/

European Commission (EC): Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. (2021). EU principles for sustainable raw materials. Publications Office of the European Union. https://data.europa.eu/doi/10.2873/09707.

EC. (2024). European Critical Raw Materials Act (CRMA). Accessed 28/10/2025 from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan/european-critical-raw-materials-act_en

European Union (EU) Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification). Accessed 28/10/2025 from https://www.iea.org/policies/17666-directive-201192eu-on-the-assessment-of-the-effects-of-certain-public-and-private-projects-on-the-environment

EU. (2023). Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries. https://eur-lex.europa.eu/eli/reg/2023/1542/oj

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

EU. (2024). Directive (EU) 2024/1203 of the European Parliament and of the Council of 11 April 2024 on the protection of the environment through criminal law and replacing Directives 2008/99/EC and 2009/123/EC.

EU. (2024). EU Regulation 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869. https://eur-lex.europa.eu/eli/reg/2024/1991/oj/eng

Food and Agriculture Organisation of the UN. (2012). Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food. First revision. Rome. https://doi.org/10.4060/i2801e

Gomes, M.E.P.; & Ramos, J. M.F. (2018). Recursos minerais de Trás-os-Montes e Alto Douro. In: Balsa, C., Teixeira, J. S. (eds.) *Recursos geológicos de Trás-os-Montes – Passado, Presente e perspetivas futuras*. Bragança: Instituto Politécnico de Bragança.

Government of Portugal. (2021). Decree Law No. 30/2021. Summary accessed 28/10/2025 from https://diariodarepublica.pt/dr/en/detail/decree-law/30-2021-162940682

GreenPaths CES Seminar. (2025). *Que desafios e caminhos para a transição energética em Portugal?* [What are the challenges and paths for the energy transition in Portugal?]. April 22, 2025. Coimbra, Portugal. CES, University of Coimbra

Iberian Mining Observatory. (2023). Mina do Barroso. Accessed 18/10/2025 from https://minob.org/english/mina-do-barroso.html

Juskus, R. (2023). Sacrifice zones: A genealogy and analysis of an environmental justice concept. Environmental Humanities, 15(1), 3-24.

Latour, B. (1993) We have never been modern. Cambridge, MA: Harvard University Press.

Li, F. (2015). Unearthing conflict: corporate mining, activism, and expertise in Peru. Duke University Press.

Mackay, D. (2022) Environmental project plan conducive to sustainable supply, MiningWeekly, Accessed 29/10/2025 from https://www.miningweekly.com/article/environmental-project-plan-conducive-to-sustainable-supply-2022-08-03

Marin, D., Dunlap, A. & Roels, R. (2023) Sacrifice Zones for Sustainability? Green Extractivism and the Struggle for a Just Transition, Bruxelles: European Environmental Bureau

Martinez-Alier, J. (2002). The Environmentalism of the poor: a study of ecological conflicts and valuation. In The Environmentalism of the Poor. Edward Elgar Publishing.

McNamara, K. E., & Jackson, G. (2019). Loss and damage: A review of the literature and directions for future research. Wiley Interdisciplinary Reviews: Climate Change, 10(2), e564.

Merchant, C. (1980). The Death of Nature: Women, Ecology, and the Scientific Revolution, San Francisco, CA: HarperCollins.

Minkova, L. G. (2024). Ecocide, sustainable development and critical environmental law insights. Journal of International Criminal Justice, 22(1), 81-97.

Poeta Fernandes, G. (2019). Rural depopulation, social resilience and context costs in the border municipalities of central Portugal. Dichotomies of social reorganization vs absence of public policies. Economía Agraria y Recursos Naturales-Agricultural and Resource Economics, 19(1), 121-149.

Proedrou, F., & Pournara, M. (2025). Exploring representations of climate change as ecocide: implications for climate policy. Climate Policy, 25(2), 269-282.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Proença, E. (2025). Dig Deep the Mining Podcast: How Savannah Resources Is Transforming Europe's Lithium Supply Chain with CEO Emanuel Proença (Jan 30, 2025): https://youtu.be/kKCwkttn0sY?si=fAKyLcEbX5xpNxVH

Pusceddu, A. (2024). Energopolitics of Transition: The Political Ecology of Anticipation in the Portuguese Lithium Rush. Anthropological Quarterly, 97(2).

Reinert, H. (2018). Notes from a projected sacrifice zone. ACME: An International Journal for Critical Geographies, 17(2), 597-617.

Riquito, M. (2023). Beyond the master narrative of 'green' modernity: A critical Reading of the energy transition. RELAÇÕES INTERNACIONAIS SPECIAL ISSUE: 2023 [pp. 023-034] https://doi.org/10.23906/ri2023.sia03

Riquito, M. (2025). "Barroso is Not to Be Sold, it is to Be Loved and Defended:" Affective Mobilizations for Land and Life in the Context of Green Extractivism. Capitalism Nature Socialism, DOI: 10.1080/10455752.2025.2562631

Rodrigues, J.V. (2024). Lítio em Boticas. "Processo de expropriação começa nos próximos dias", diz CEO da Savannah. Diário do Noticias. Accessed 28/10/2025 from https://www.dn.pt/economia/litio-em-boticas-processo-de-expropriacao-comeca-nos-proximos-dias-diz-ceo-da-savannah

Rodriguez Fernandez, G. V. (2020). Neo-extractivism, the Bolivian state, and indigenous peasant women's struggles for water in the Altiplano. *Human Geography*, *13*(1), 27-39.

Rosga, A., & Satterthwaite, M. L. (2009). The trust in indicators: measuring human rights. Berkeley J. Int'l Law, 27, 253.

Saleth, L. A. & Varov, I. (2023). Anticipating lithium extraction in northern Portugal: A Sacrifice Zone in the making? Journal of Political Ecology, 30, 2023.

Sarantakos, S. (2005). Social Research Methods. Third Edition. Sage. London.

Savannah Resources PLC. (2024). Annual report and financial statements: 2024. https://www.savannahresources.com/media/vf4jxwsb/financial-results-for-the-year-ended-31-dec-2024.pdf

Scott, D. N., & Smith, A. A. (2017). "Sacrifice zones" in the green energy economy: toward an environmental justice framework. McGill Law Journal, 62(3), 861-898.

Silva, L., & Sareen, S. (2023). The calm before the storm? The making of a lithium frontier in transitioning Portugal. Extractive Industries and Society, 15. https://doi.org/10.1016/j.exis.2023.101308

Swyngedouw, E. (2007) "Impossible 'sustainability' and the postpolitical condition", In R. Krueger and D. Gibbs (eds) The sustainable development paradox, New York: The Guilford Press. 13-40.

Tschakert, P., Barnett, J., Ellis, N., Lawrence, C., Tuana, N., New, M., ... & Pannell, D. (2017). Climate change and loss, as if people mattered: values, places, and experiences. Wiley Interdisciplinary Reviews: Climate Change, 8(5), e476.

UN Economic Commission for Europe (UNECE) Aarhus Committee. (2025). ACCC/C/2021/186, 22 August 2025

UN Human Rights Council (HRC). (2018). United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas: resolution / adopted by the Human Rights Council on 28 September 2018. A/HRC/RES/39/12

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

UN HCR. (2023). Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, David R. Boyd: Visit to Portugal. A/HRC/52/33/Add.1

UN General Assembly (GA). (2010). Res. 64/292: The human right to water and sanitation, 28 July 2010. Accessed 28/10/2025 from https://documents.un.org/doc/undoc/gen/n09/479/35/pdf/n0947935.pdf?OpenElement

UN GA. (2015). Res. 70/169: The human rights to safe drinking water and sanitation, 17 December 2015. Accessed 28/10/2025 from http://www.cawater-info.net/library/eng/n1544272.pdf

Van Dijk, T. A. (1993). Principles of Critical Discourse Analysis. Discourse & Society, 4(2), 249-283. https://doi.org/10.1177/0957926593004002006

Velicu, I., & Kaika, M. (2017). Undoing environmental justice: Re-imagining equality in the Rosia Montana anti-mining movement. Geoforum, 84, 305-315.

Velicu, I. (2018). Demonizing the sensible and the 'revolution of our generation' in Rosia Montana. In Global Insurrectional Politics (pp. 32-44). Routledge.

Velicu, I. (2020). Prospective environmental injustice: insights from anti-mining struggles in Romania and Bulgaria. Environmental politics, 29(3), 414-434.

Venes, F., Barca, S. & Navas, G. (2023) Not victims, but fighters: A global overview on women's leadership in anti-mining struggles, Journal of Political Ecology 30(1), 105–143. doi: https://doi.org/10.2458/jpe.3054

Vivoda, V., Nieboer, L., & Bishop, R. (2025). Narrative warfare in critical minerals: Information manipulation and governance challenges. The Extractive Industries and Society, 25, 101798.

Wappelhorst, S. (2021). Beyond major cities: Analysis of electric passenger car uptake in European rural regions. International Council on Clean Transportation. Retrieved 29/10/2025, from https://theicct.org/sites/default/files/publications/Ev-europe-rural-mar2021.pdf

World Bank. (2022). Renewable energy consumption (% of total final energy consumption). Accessed 28/10/2025 from https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS

Zografos, C. (2022). The contradictions of Green New Deals: green sacrifice and colonialism. Soundings, 80(80), 37-50.

Zografos, C. & Robbins, P. (2020) Green Sacrifice Zones, or Why a Green New Deal Cannot Ignore the Cost Shifts of Just Transitions. One Earth, 3 (5): 543 – 546.

Case study 2

Adevărul. (2016). A Deputy Requests Answers from the Minister of Environment. Accessed 29/10/2025 from https://adevarul.ro/stiri-interne/evenimente/un-deputat-cere-ministrului-mediului-sa-raspunda-1743290.html

Adevărul. (2018). Foreign Billionaires Buying Romania's Virgin Forests. Accessed 29/10/2025 from https://adevarul.ro/stiri-locale/pitesti/miliardarii-straini-care-cumpara-padurile-virgine-1856921.html#google_vignette

Adevărul. (2022a). Bear Monitoring Initiative. Accessed 29/10/2025 from https://adevarul.ro/stiri-locale/brasov/ursi-din-muntii-fagaras-monitorizati-cu-colare-2227304.html

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Adevărul. (2022b). Reintroducing European Bison. Accessed 29/10/2025 from https://adevarul.ro/stiri-interne/societate/dupa-200-de-ani-de-absenta-28-de-zimbri-s-au-2176717.html

Adevărul. (2024). "Bison Paradise" in Romania. Accessed 29/10/2025 from https://adevarul.ro/stiri-locale/pitesti/romania-devine-un-paradis-al-zimbrilor-de-ce-au-2410561.html

Almeida, D. V., Kolinjivadi, V., Ferrando, T., Roy, B., Herrera, H., Gonçalves, M. V., & Van Hecken, G. (2023). The "greening" of empire: The European Green Deal as the EU first agenda. Political Geography, 105, 102925.

Andreucci, D., García-Lamarca, M., Wedekind, J., & Swyngedouw, E. (2017). "Value grabbing": A political ecology of rent. *Capitalism Nature Socialism*, *28*(3), 28-47.

Antena 3. (2016). Premeditated Robbery. Accessed 29/10/2025 from https://www.youtube.com/watch?v=hTjSbziTGyY

Bogojevic, S (2024) Carbon removals, ecosystems and the European Green Deal, European Law Open 3, 199–208. doi:10.1017/elo.2024.11

Brandajs, F. (2025) Advancing theories on the scalar complexities of Green Sacrifice Zones, Energy Research & Social Science 127 (online).

Buscher, B., & Fletcher, R. (2020). The conservation revolution: radical ideas for saving nature beyond the Anthropocene. Verso Books.

Buscher, B., & Fletcher, R. (2015) Accumulation by Conservation, New Political Economy, 20:2, 273-298, DOI: 10.1080/13563467.2014.923824

Duckett, D., Bjorkhaug, H., Mur, L.A., & Plmioli, L. (2022) New 'old' risks on the small farm: Iconic species rewilding in Europe, Land Use Policy 118 (online). https://doi.org/10.1016/j.landusepol.2022.106115

Dunlap, A., Verweijen, J. & Tornel, C., (2024) "The political ecologies of "green" extractivism(s): An introduction", Journal of Political Ecology 31(1), 436–463. doi: https://doi.org/10.2458/jpe.6131

El País (Spain). (2024). A group of philanthropists is buying large tracts of land in Romania to create a "European Yellowstone". Accessed 29/10/2025 from https://elpais.com/clima-y-medio-ambiente/2024-03-29/un-grupo-de-filantropos-compra-grandes-extensiones-de-tierra-en-rumania-para-crear-un-yellowstone-europeo.html

European Union (EU). (2024). Regulation (EU) 2024/3012 of the European Parliament and of the Council of 27 November 2024 establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products. Accessed 29/10/2025 from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202403012

EuroStat. (2023). European Union Statistics on Income and Living Conditions (EU-SILC). (2023). Accessed 29/10/2025 from https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions

EuroStat. (2023). People at risk of poverty or social exclusion in 2024. Accessed 29/10/2025 from https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20250430-2

Fletcher, R. & Buscher, B. (2017) Conceit: Revisiting the Relationship between Payments for Environmental Services and Neoliberal Conservation, Ecological Economics 132, 224–231.

Forest Policy.org. (2024). Romania' Forest Law and Policy. Romania. Last updated: June 2024. Retrieved 28/10/2025 https://forestpolicy.org/sites/default/files/pdf/romania.pdf

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Foundation Conservation Carpathia (FCC). (2019). Final Report Covering the Project Activities, 2012-2018. Retrieved 6/11/20125 from https://www.carpathia.org/wp-content/uploads/2019/01/Final-Report-2018_final_web.pdf

FCC. (2024). FCC Annual Report, 2024. Retrieved 29/10/2025 from https://www.carpathia.org/wp-content/uploads/2025/08/FCC_2024-Annual-Report_EN.pdf

Gandul. (2025). "Unseen Face of the Beaver Project". Accessed 29/10/2025 from https://www.gandul.ro/actualitate/fata-nevazuta-a-dezastrului-de-la-praid-cine-este-miliardarul-implicat-in-aducerea-castorilor-care-au-blocat-lucrarile-pentru-devierea-paraului-corund-20534581

G4Media. (2021). Genetic Bear Census in Făgăraș. Accessed 29/10/2025 from https://www.g4media.ro/studiu-au-fost-identificati-283-de-ursi-pe-o-suprafata-de-1-200-de-kilometri-patrati-in-muntii-fagaras-si-imprejurimi-densitatea-estimata-este-de-17-18-exemplare-la-100-de-kilometri-patra.html

Government of Romania. (2024). Integrated National Energy and Climate Plan (INECP) 2025-2030. Retrieved 29/10/2025 from https://commission.europa.eu/publications/romania-final-updated-necp-2021-2030-submitted-2024_en

The Guardian. (2023). 'A Yellowstone for Europe': Romania's ambition for a vast new wilderness reserve. Accessed 29/10/2025 from https://www.theguardian.com/travel/2023/oct/22/a-yellowstone-for-europe-romanias-ambition-for-a-vast-new-wilderness-reserve

Guyomard, H., Détang-Dessendre, C., Dupraz, P., Delaby, L., Huyghe, C., Peyraud, J. L., ... & Sirami, C. (2023). How the Green Architecture of the 2023–2027 Common Agricultural Policy could have been greener. *Ambio*, *52*(8), 1327-1338.

Holmes, G. (2012) Biodiversity for Billionaires: Capitalism, Conservation and the Role of Philanthropy in Saving/Selling Nature, Development and Change 43(1): 185–203. DOI: 10.1111/j.1467-7660.2011.01749.x

International Labour Organisation (ILO). (2023). Statistics on the population and labour force. Accessed 29/10/2025 from https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS

Iordăchescu, G. (2022) Convivial Conservation Prospects in Europe—From Wilderness Protection to Reclaiming the Commons. Conservation and Society, 20(2), 156-166.

Iordăchescu, G. (2021a). Becoming a virgin forest: From remote sensing to erasing environmental history. Environment & Society Portal, Arcadia, 10. Rachel Carson Center for Environment and Society.

Iordăchescu, G. (2021b). The Shifting Geopolitical Ecologies of Wild Nature Conservation in Romania, in Kovacs (ed), Politics and the Environment in Eastern Europe, Open Book Publisher

Iordăchescu, G. (2018) Making the 'European Yellowstone'—Unintended Consequences or Unrealistic Intentions? Environment & Society Portal, Arcadia, 10. Rachel Carson Center for Environment and Society.

Iordăchescu, G., & Vasile, M. (2023). Forests of fear: Illegal logging, criminalization, and violence in the carpathian mountains. Annals of the American Association of Geographers, 113(9), 2108-2125.

Ipsen, A., & Lequieu, A.M. (2025) From rationalized exploitation to supra sacrifice zones: Tracing sacrifice zones as a keyword of environmental sociology, Environmental Sociology, 11(3), 351-362. DOI: 10.1080/23251042.2024.2430390

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Joint Research Centre (JRC) Data Catalogue. (2023). Accessed 29/10/2025 from https://data.jrc.ec.europa.eu/dataset?keyword=population

Juskus, R. (2023). A Genealogy and Analysis of an Environmental Justice Concept, Environmental Humanities 15(1). DOI 10.1215/22011919-10216129

Latour, B (1993) We have never been modern. Cambridge, MA: Harvard University Press.

Le Billon, P. (2021). "Crisis conservation and green extraction: biodiversity offsets as spaces of double exception", Journal of Political Ecology 28(1), 854–888. doi:https://doi.org/10.2458/jpe.2991

Libertatea. (2021). Beaver Relocation Programme. Accessed 29/10/2025 from https://www.libertatea.ro/stiri/90-de-castori-vor-fi-adusi-de-un-ong-in-muntii-fagaras-dupa-mai-bine-de-un-secol-de-la-disparitia-in-aceasta-zona-3839067

Libertatea. (2024). "European Yellowstone" Vision. Accessed 29/10/2025 from https://www.libertatea.ro/stiri/un-grup-de-filantropi-straini-cumpara-zeci-de-mii-de-hectare-de-teren-in-muntii-fagaras-ca-sa-creeze-in-romania-un-yellowstone-european-4844732

Libertatea. (2025). Environmental Funding Overview. Accessed 29/10/2025 from https://observatornews.ro/eveniment/ziua-pamantului-2025-in-weekendul-pastelui-romania-a-avut-cel-mai-mic-consum-de-energie-din-istorie-617177.html

Monitorul de Făgăraș. (2019). The Yellowstone Affair: Făgăraș Forests at the Mercy of the Rich. Accessed 29/10/2025 from https://www.monitorfg.ro/2019/05/08/afacerea-yellowstone-padurile-fagarasilor-la-mana-bogatilor-lumii-fundatia-conservation-carpathia-nu-se-lasa/

Monitorul de Făgăraș. (2023). Villagers Revolted over Informal Funding. Accessed 29/10/2025 from https://www.monitorfg.ro/2023/04/08/video-conservation-carpathia-sponsorizeaza-bani-din-aer-la-nucsoara-satenii-sunt-revoltati/

Monitorul de Făgăraș. (2024a). "Făgăraș Is Not for Sale" – Forest Owners Resist. Accessed 29/10/2025 from https://www.monitorfg.ro/2024/04/01/fundatia-conservation-carpathia-nu-se-lasa-afacerea-yellowstone-muntii-fagarasului-nu-sunt-de-vanzare-spun-propritarii-de-paduri-din-masivul-fagaras/

Monitorul de Făgăraș. (2024b). €27 Million Park Expansion with Government Derogation. Accessed 29/10/2025 from https://www.monitorfg.ro/2024/04/17/zimbrii-castorii-si-parcul-national-muntii-fagarasului-afacerea-fundatiei-conservation-carpathia-proiect-de-27-milioane-euro-cu-derogare-de-la-ministerul-mediului/

Nacu, T., & Jercan, E. (2023). Environmental Economy and Green Transition in the European Union: Two Complementary Concepts. In Proceedings of the International Conference on Business Excellence, Vol. 17, No. 1, pp. 1497-1508.

National Geographic. (2024). A Yellowstone for Europe? Inside the bold effort to rewild the continent. Accessed 29/10/2025

The New York Times. (2024). "The Trees Saved Me". Accessed 29/10/2025 from https://www.nytimes.com/2024/01/09/science/conservation-romania-beech-trees.html

Nostra Silva. (2019). Recording of public meeting with FCC. Accessed 29/10/2025 from https://www.youtube.com/watch?v=vaSMBz23KdQ&t=2s

Savin Bursan, I., Iordachescu, G., Ungureanu, C. & Velicu, I. (2025). (2025). GreenPaths Webinar: "Situating convivial conservation in the Just Transition". GreenPaths YouTube channel: https://youtu.be/PZnSbtavHe4?si=eM5IHWHci8rXudDP

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Scott, D. N. & Smith, A. A. (2017). "Sacrifice Zones" in the Green Energy Economy: Toward an Environmental Justice Framework. McGill Law Journal / Revue de droit de McGill, 62(3), 861–898. https://doi.org/10.7202/1042776ar

Sikor, T., Stahl, J., & Dorondel, S. (2009). Negotiating post-socialist property and state: struggles over forests in Albania and Romania. Development and Change, 40(1), 171-193.

Swyngedouw, E. (2010). Apocalypse forever? *Theory, culture & society*, *27*(2-3), 213-232.

Uggla, Y. (2010) "What is this thing called 'natural'? The nature-culture divide in climate change and biodiversity policy", Journal of Political Ecology 17(1), 79-91. doi: https://doi.org/10.2458/v17i1.21701

Ungureanu, D., & Promberger, C. (2018). Socio-economic report: Social and economic impact of the LIFE+ project "Ecological restoration of forest and aquatic habitats on the Upper Dâmboviţa River, Munţii Făgăraș". FCC. Retrieved 29/10/2025 from https://www.carpathia.org/wp-content/uploads/2019/05/D.5-Socio-economic-assessment-Report-2018103.pdf

Vasile, M. (2022). The other frontier: forest rush and small-scale timbermen of postsocialist Transylvania. The Journal of Peasant Studies, 49(2), 429-454.

Vesalon, L. & Anghel, R.G. (2024) The "European Yellowstone": Entrepreneurs of the Wilderness and Transnational Elites in the Romanian Carpathians, Antipode, 56 (3), pp. 1047-1067

Voicu, S., & Vasile, M. (2022). Grabbing the commons: Forest rights, capital and legal struggle in the Carpathian Mountains. Political Geography, 98, 102718.

Williment, C. (2025). COP 30: How 34 Governments are Ending the Forest Finance Gap. Sustainablity Magazine, November 4, 2025. Accessed 6/11/2025 from https://sustainabilitymag.com/news/cop-30-how-34-governments-are-ending-the-forest-finance-gap

Zografos, C. (2022) The contradictions of Green New Deals: green sacrifice and colonialism, Soundings, 2022(80), 37-50.

Zografos, C. & Robbins, P. (2020) Green Sacrifice Zones, or Why a Green New Deal Cannot Ignore the Cost Shifts of Just Transitions. One Earth, 3 (5): 543 – 546.

Case study 3

Abram, S., Atkins, E., Dietzel, A., Jenkins, K., Kiamba, L., Kirshner, J., Kreienkamp, J., Parkhill, K., Pegram, T., and Santos Ayllon, L. M. (2022). Just Transition: A whole-systems approach to decarbonisation. *Climate Policy*, *22*(8), 1033–1049. https://doi.org/10.1080/14693062.2022.2108365.

Alves Dias, P. et al. (2018). *EU coal regions: opportunities and challenges ahead*, EUR 29292 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-89884-6, doi:10.2760/064809, JRC112593

Baran, J., Szpor, A., & Witajewski-Baltvilks, J. (2020). Low-carbon transition in a coal-producing country: A labour market perspective. *Energy Policy*, 147, 111878. https://doi.org/10.1016/j.enpol.2020.111878.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Cambou, D. (2020). Uncovering injustices in the green transition: Sami rights in the development of wind energy in Sweden. *Arctic Review on Law and Politics*, *11*. https://doi.org/10.23865/arctic.v11.2293.

Chateau, J., Bibas, R., & Lanzi, E. (2018). Impacts of green growth policies on labour markets and wage income distribution: A general equilibrium application to climate and energy Policies. DOI:10.1787/ea3696f4-en

Chun, H. K. (2024). Falling through the cracks? skilling, reskilling and upskilling for job transitions. In *Rethinking economic transformation for sustainable and inclusive development* (pp. 205–234). Edward Elgar Publishing.

Comisiones Obreras (July 2020*). Guía Sindical de Intervención en los Convenios de Transición Justa* [*Trade Union guide to the Just Transition Agreements*]. Secretaria Confederal de Medio Ambiente y Movilidad de CCOO. https://www.ccoo.es/0c689724c1ed0a6a8306a139b3d15cea000001.pdf

Cantoni, R., & Brisbois, M. C. (2024). En route to decarbonization: A periodisation of just transition in four carbon-intensive EU regions. *Geoforum*, 154, 104061. https://doi.org/10.1016/j.geoforum.2024.104061

Del Río, Pablo (2017). *Coal Transition in SPAIN. An historical case study for the project "Coal Transitions: Research and Dialogue on the Future of Coal"*, IDDRI and Climate Strategies. Available at: https://www.iddri.org/en/publications-and-events/report/coal-transition-spain

European Commission, Joint Research Centre, Rueda Cantuche, J. M., López Alvarez, J. M., Pedauga, L., Catalán Piera, A. and Marques Santos, A. (2025) *The employment impact of the coal transition in EU regions,* Publications Office of the European Union, Luxembourg, 2025, https://data.europa.eu/doi/10.2760/4898550, JRC139404

Frondel, M., Sommer, S., & Vance, C. (2015). The burden of Germany's energy transition: An empirical analysis of distributional effects. *Economic Analysis and Policy*, 45, 89–99.

Garha, Nachatter. (2022). From Decarbonization to Depopulation: An Emerging Challenge for the Carbon-Intensive Regions under the Energy Transition in Spain. *Sustainability*. 14. 14786. 10.3390/su142214786 DOI:10.3390/su142214786

Haug, C., Eden, A., & de Oca, M. M. (2018). *Addressing the distributional impacts of carbon pricing policies.* Berlin: adelphi.

Heffron, R. J., and De Fontenelle, L. (2023). Implementing energy justice through a new social contract. *Journal of Energy & Natural Resources Law*, *41*(2), 141–155. https://doi.org/10.1080/02646811.2023.2186626.

IGME, Instituto Geológico y Minero de España (2022). *Panorama Minero 2022*, IGME. Available at: https://info.igme.es/media/Pdfs/PANORAMA%20MINERO%202022.pdf

INE, Instituto Nacional de Estadística [National Statistics Institute of Spain], 2025. *Cifras oficiales de población de los municipios españoles en aplicación de la Ley de Bases del Régimen Local (Art. 17)*. https://ine.es/jaxiT3/Tabla.htm?t=2877

Instituto para la Transición Justa [Just Transition Institute] (July 2022). *Spain, towards a just energy transition. Executive report.* Gobierno de España. https://energy.ec.europa.eu/document/download/70e347f4-0a16-465a-a4a3-dce66ac6843f_en?filename=220707_Spain_JustTransition.pdf

Instituto para la Transición Justa [Just Transition Institute] (October 2020). *Convenio de Transición Justa del Bierzo – Laciana. Plan de Acción Urgente para comarcas de carbón y centrales en cierre 2019-2021. Caracterización y diagnóstico.* Gobierno de España.

https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/el_instituto/Convenios_transicion_justa/common/Islas_Baleares/Castilla_Leon/Caracterizacion%20Bierzo_Laciana.pdf

Instituto para la Transición Justa [Just Transition Institute] (April 2022). *Transición Justa en Bierzo-Laciana* [Just Transition in Bierzo-Laciana]. Gobierno de España. https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/Convenios_transicion_justa/Informe%20Transici%C3%B3nJusta%20BierzoLaciana_abril2025.pdf

Juhola, S., Heikkinen, M., Pietila, T., Groundstroem, F., and Kayhko, J. (2022). Connecting climate justice and adaptation planning: An adaptation justice index. *Environmental Science and Policy*, *136*, 609–619. https://doi.org/10.1016/J.ENVSCI.2022.07.024.

Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., … & Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions, 31*, 1–32. https://doi.org/10.1016/J.EIST.2019.01.004.

Krawchenko, T. A., and Gordon, M. (2021). How do we manage a just transition? A comparative review of national and regional just transition initiatives. *Sustainability (Switzerland)*, *13*(11). https://doi.org/10.3390/su13116070.

Lager, F., Coninx, I., Breil, M., Bakhtaoui, I., Branth Pedersen, A., Mattern, K., van den Berg, H., Sini, E., Galluccio, G., Klein, R., and Vierikko, K. (2023). *Just Resilience for Europe: Towards measuring justice in climate change adaptation - ETC CA Report*. https://climate-adapt.eea.europa.eu/en/

Lempinen, H., and Vainio, A. (2022). Livelihood practitioners' experiences of Finland's "just" peat energy transition. *Terra*, *134*(3). https://doi.org/10.30677/terra.113497

López, P., Kyriacou, C., & Fokaides, P.A. (2024). Deliverable D2. 1: *Local cet plans framework, including stakeholders mapping and skills gap analysis*. European Commission. https://www.iesve.com/research/step-wise/local-cet-plans-framework.pdf

Mandelli, M., Cacciapaglia, M., and Sabato, S. (2023). EU Eco-social Policies for a «Just Transition»: Comparing the Just Transition Fund and the Social Climate Fund. *Politiche Sociali*, 1. https://doi.org/10.7389/107140

Merino Martos, A. (2023). *Impactos Socioeconómicos de la Transición Energética*. Secretaría Confederal de Transiciones Estratégicas y Desarrollo Territorial de CCOO. https://ccoopuntodeobservacionindustrial.es/wp-content/uploads/Impactos-Socioeconomicos-de-la-Transicion-energetica.pdf

Ministerio de Industria, Energía y Turismo (2013). *Marco de Actuación para la Minería del Carbón y las Comarcas Mineras en el Período 2013-2018*. [Framework of Action for Coal Mining and Mining Regions in the Period 2013-2018]. Gobierno de España. https://ugt-fica.org/images/Convenios/mineria/marcomineriadelcarbon.pdf

MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico (2018). *Acuerdo Marco para una Transición Justa de la Minería del Carbón y el desarrollo Sostenible de las Comarcas Mineras para el Periodo 2019-2027* [Framework Agreement for a Just Transition of Coal Mining and the Sustainable Development of Mining Regions for the Period 2019-2027]. Gobierno de España. https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/Noticias/common/Acuerdo_Marco_para_una_transicion_justa_de_la_mineria_del_carbon_2019-2027.pdf

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

MITECO, Ministry for Ecological Transition and the Demographic Challenge (2020). *Just Transition Strategy.* Gobierno de España. https://www.miteco.gob.es/content/dam/miteco/es/ministerio/planes-estrategias/transicion-justa/Just%20Transition%20Strategy_ENG.pdf

MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico (2020b). *Estrategia de Descarbonización a Largo Plazo para una Economía Española Moderna, Competitiva y Climáticamente Neutra en 2050* [Long-Term Decarbonisation Strategy for a Modern, Competitive and Climate Neutral Spanish Economy by 2050]. Gobierno de España. https://www.miteco.gob.es/content/dam/miteco/es/prensa/documentoelp_tcm30-516109.pdf

MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico (2021) *Acuerdo por una transición energética justa para centrales térmicas en cierre: el empleo, la industria y los territorios.* [Agreement for a fair energy transition for thermal power plants in closure: employment, industry and territories] Gobierno de España https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/acuerdoporunatransicionenergeticajustaparacentralestermicasencierrees.pdf

MITECO, Ministry for Ecological Transition and the Demographic Challenge (2023) *Agreement for a fair energy transition for thermal power plants in closure: employment, industry and territories. Report-Monitoring Board meeting*. Gobierno de España https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/Comision_Termicas/Report_Monitoring_board_meeting%20_26_OCt_23%20DEF_EN.pdf

MITECO, Ministry for Ecological Transition and the Demographic Challenge (2024a). *5 Years of the Framework Agreement for a Just Transition of the Coal Mining Industry and Sustainable Development of Mining Regions for the Period 2019-2027*. Gobierno de España. Available at: https://www.transicionjusta.gob.es/content/dam/itj/files-1/Documents/Comision_mineria/5%20years%20of%20coal%20mining%20closure%20agreement-%20EN.pdf

MITECO, Ministry for Ecological Transition and the Demographic Challenge (2024b). *Plan Nacional Integrado de Energía y Clima ACTUALIZACIÓN 2023-2030* [National Integrated Energy and Climate Plan UPDATE 2023-2030] Gobierno de España https://www.miteco.gob.es/es/energia/estrategia-normativa/pniec-23-30.html

MITES, Ministerio de Trabajo y Economía Social (2025). *Estadísticas por municipios: Paro registrado y contratos por municipios*. https://www.sepe.es/HomeSepe/que-es-el-sepe/estadisticas/datos-estadisticos/municipios.html

Piggot, G., Boyland, M., Downie, C., & Gabbatiss, J. (2019). *Realising a just and equitable transition away from fossil fuels*. Stockholm Environment Institute. https://www.sei.org/publications/realising-just-equitable-transition-away-fossil-fuels/

Rabanal, N. (2005). Importancia de los planes de reordenación en la reconversión del carbón en España. *Pecunia: Revista de la Facultad de Ciencias Económicas y Empresariales*. 67-. DOI:10.18002/pec.v0i1.742

Rabanal, N. (2009). Coal restructuring in Spain: Continuity and uncertainty? *Energy Policy*, *37*, 4373–4378. DOI: https://doi.org/10.1016/j.enpol.2009.05.052

Rodríguez-Pose, A. and Bartalucci, F. (2024) The green transition and its potential territorial discontents, Cambridge Journal of Regions, *Economy and Society*, Volume 17, Issue 2, July, 339–358, https://doi.org/10.1093/cjres/rsad039

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Rud, J.-P., Simmons, M., Toews, G., & Aragon, F. (2024). Job displacement costs of phasing out coal. *Journal of Public Economics*, *236*, 105167.

Sanz-Hernández, A., Ferrer, C., Rodríguez, M., & Marco-Fondevila, M. (2020). Visions, innovations, and justice? Transition contracts in Spain as policy mix instruments. *Energy Research & Social Science.* 70(10).101762. DOI:10.1016/j.erss.2020.101762

Seo, H. (2021). 'dual'labour market? patterns of segmentation in european labour markets and the varieties of precariousness. *Transfer: European review of labour and research*, *27* (4), 485–503.

Sovacool, B. K., Hook, A., Martiskainen, M., & Baker, L. (2020). The concept of "justice" in energy transitions. *Energy Policy, 133*, 110866. https://doi.org/10.1016/j.enpol.2019.110866

Venditto, B. & Kamwanyah N. J. (2025). Green Energy or Green Colonialism? The Case of Green Hydrogen in Namibia. *Nuovi Autoritarismi E Democrazie: Diritto, Istituzioni, Società (NAD-DIS)*, 7(1), 167–183. https://doi.org/10.54103/2612-6672/28852

Wier, M., Birr-Pedersen, K., Jacobsen, H. K., & Klok, J. (2005). Are CO_2 taxes regressive? evidence from the danish experience. *Ecological economics*, 52 (2), 239–251.

Zahnow, R., Yousefnia, A. R., Hassankhani, R. and Cheshmehzangi, A. (2025) Climate change inequalities: A systematic review of disparities in access to mitigation and adaptation measures, *Environmental Science & Policy*, 165, https://doi.org/10.1016/j.envsci.2025.104021

Case study 4

Agency for Agricultural Markets and Rural Development. (2016). Data on distribution of direct payments by farm size in Slovenia. Agencija RS za kmetijske trge in razvoj podeželja.

Apostolopoulou, E., Cortes-Vazquez, J. A., & Adams, W. M. (2021). Green grabbing and the contested nature of the green economy. Ambio, 50(2), 212–227.

Anguelovski, I. (2014). Neighborhood as refuge: Community reconstruction, place remaking, and environmental justice in the city. MIT Press.

Avila, S. (2018). Environmental justice and the expanding geography of wind po

wer conflicts. Sustainability Science, 13(3), 599–608. https://doi.org/10.1007/s11625-018-0557-2

Bilewicz, A., Mamonova, N., & Burdyka, K. (2022). "Paradoxical" Dissatisfaction among Post-Socialist Farmers with the EU's Common Agricultural Policy: A Study of Farmers' Subjectivities in Rural Poland. East European Politics and Societies, 36(3), 892-912.

Bojnec, Š., & Latruffe, L. (2005). Farm size, agricultural subsidies and farm performance in Slovenia. European Review of Agricultural Economics, 32(2), 301–323. https://doi.org/10.1093/eurrag/jbi010

Bojnec, Š., & Latruffe, L. (2007). Farm size and efficiency: The case of Slovenia. Conference: 100th Seminar of the European Association of Agricultural Economists (EAAE)

Borras, S. M., & Franco, J. C. (2013). Global land grabbing and political reactions "from below." Third World Quarterly, 34(9), 1723–1747. https://doi.org/10.1080/01436597.2013.843845

Borras, S. M., & Franco, J. C. (2018). The challenge of locating land-based climate change mitigation and adaptation politics within a broader land politics: Towards a land-political

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

analysis of climate change. Canadian Journal of Development Studies, 39(2), 175–192. https://doi.org/10.1080/02255189.2018.1467484

Borras, S. M., & Franco, J. C. (2025). The Oxford handbook of land politics . Oxford University Press.

Bunkus, R., & Theesfeld, I. (2018). Land grabbing in Europe? Socio-cultural externalities of large-scale land acquisitions in German agriculture. Land, 7(3), 98. https://doi.org/10.3390/land7030098

Burandt, A., & Mölders, T. (2017). "Nature–gender relations within a social-ecological perspective on European multifunctional agriculture: the case of agrobiodiversity," Agriculture and Human Values, Springer;The Agriculture, Food, & Human Values Society (AFHVS), vol. 34(4), pages 955-967.

Burja, V., Tamas-Szora, A., & Dobra, I. B. (2020). Land concentration, land grabbing and sustainable development of agriculture in Romania. Sustainability, 12(5), 2137.

Barlow, Nathan & Regen, Livia & Cadiou, Noemie & Chertkovskaya, Ekaterina & Hollweg, Max & Plank, Christina & Schulken, Merle & Wolf, Verena. (2022). Degrowth & Strategy: how to bring about social-ecological transformation.

Borras, S. M., & Franco, J. C. (2013). Global land grabbing and political reactions from below. Third World Quarterly, 34(9), 1723–1747.

Borras, S. M., & Franco, J. C. (2025). Land politics, agrarian justice, and climate crisis. In S. M. Borras, J. C. Franco, & B. McKay (Eds.), The Oxford handbook of land politics. Oxford University Press.

Bunkus, R., & Theesfeld, I. (2018). Land grabbing in Europe? Socio-cultural externalities of large-scale land acquisitions in East Germany. Land, 7(3), 98.

Burja, C., Burja, V., & Rusu, M. (2020). The Common Agricultural Policy and farm structures in the new EU member states. Agricultural Economics and Rural Development, 17(1), 21–38.

Centrih, L., & Sitar, S. (2022). Pol kmet, pol proletarec. Integrirana kmečka ekonomija v socialistični Sloveniji, 1945-199. Slovenska znanstvena zbirka za humanistiko (SZZH).

Colsaet, A., Laurans, Y., & Levrel, H. (2023). No net land take by 2050? Assessing the potential and limitations of European land-use policy. Land Use Policy, 124, 106–150.

Calo, A., De Master, K., & Mattera, P. (2021). Property, power and inequality: Landownership and agroecological transitions. Journal of Rural Studies, 83, 279–290.

Colsaet, A., Laurans, Y., Levrel, H., & Salles, J.-M. (2023). Governing the 'no net land take' objective: Challenges for territorial planning in Europe. Journal of Environmental Policy & Planning, 25(3), 281–297.

D'Alisa, G., Demaria, F., & Kallis, G. (Eds.). (2014). Degrowth: A vocabulary for a new era. Routledge.

Demaria, F., Kallis, G., March, H., & Pereira, Â. G. (2023). Degrowth and the politics of socio-ecological transformations. In M. Koch & F. Petrick (Eds.), Postgrowth and wellbeing: Challenges to sustainable welfare. Edward Elgar.

Dorninger, C., Hornborg, A., Abson, D. J., von Wehrden, H., Schaffartzik, A., Giljum, S., Engler, J. O., Feller, R. L., Hubacek, K., & Wieland, H. (2021). Global patterns of ecologically unequal exchange: Implications for sustainability in the 21st century. Ecological Economics, 179, 106824. https://doi.org/10.1016/j.ecolecon.2020.106824

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

D'Alisa, G., Demaria, F., & Kallis, G. (Eds.). (2014). Degrowth: A vocabulary for a new era. Routledge.

Domazet, M. (ur.). 2017. Ecology and Justice: Contributions from the margins. Zagreb: Institute for Political Ecology

European Commission. (2019). The European Green Deal (COM(2019) 640 final).

European Commission. (2020a). A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system (COM(2020) 381 final).

European Commission. (2020b). EU Biodiversity Strategy for 2030: Bringing nature back into our lives (COM(2020) 380 final).

European Commission. (2021). EU Soil Strategy for 2030 (COM(2021) 699 final).

European Parliament. (2017). European Parliament resolution of 27 April 2017 on the state of play of farmland concentration in the EU (2016/2141(INI)).

Eurostat. (2020). Farm structure survey 2010–2020 [Data set].

Erjavec, E., and Erjavec, K. (2015). "Greening the CAP" – Just a fashionable justification? Annals of Agricultural and Environmental Medicine, 22(2), 364–370.

Erjavec, E., Juvančič, L., Lovec, M., Šumrada, T., & Volk, T. (2021). The new CAP 2023–2027 and its implications for small farms in Slovenia. Kmetijstvo in gozdarstvo, 77(2), 85–104.

European Coordination Via Campesina (ECVC). (2021). Women, land and agriculture in Europe: A feminist perspective on access to land and CAP reform. ECVC.

Fetting, C. (2020). The European Green Deal. In Green Deal for Europe – Policy paper series. Heinrich-Böll-Stiftung.

Franco, J. C., Monsalve Suárez, S., & Borras, S. M. (2013). Land concentration, land grabbing and people's struggles in Europe. TNI Agrarian Justice Programme Report. Transnational Institute.

Fjeldstad, Ø., Benjaminsen, T. A., & Svarstad, H. (2020). Green grabbing through rewilding: The case of Northern Europe. Journal of Political Ecology, 27(1), 601–619.

Fairbairn, M. (2020). Fields of gold: Financing the global land rush. Cornell University Press.

FIAN International. (2013). Land concentration, land grabbing and people's struggles in Europe. FIAN International.

FIAN International. (2019). Land concentration, land grabbing and agrarian struggles in Europe: Update. FIAN International.

Franco, J. C., Borras, S. M., & others. (2013). Global land grabbing and political reactions from below. Third World Quarterly, 34(9), 1723–1747.

Glušćević, S., & Katić, K. (2019). Land grabbing and agrarian restructuring in Serbia. In T. Domazet & A. Ančić (Eds.), Food, agriculture and sustainability in the Western Balkans (pp. 55–78). Institute for Political Ecology.

Graeub, B. E., Chappell, M. J., Wittman, H., Ledermann, S., Kerr, R. B., & Gemmill-Herren, B. (2016). The state of family farms in the world. World Development, 87, 1–15.

Guy, C., et al. (2017). Study on the impact of the EU's Common Agricultural Policy on farmland concentration. European Parliament.

Guyomard, H., Détang-Dessendre, C., Dupraz, P., Delaby, L., Huyghe, C., Peyraud, J. L., ... & Sirami, C. (2023). How the Green Architecture of the 2023–2027 Common Agricultural Policy could have been greener. Ambio, 52(8), 1327-1338.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Guth, M., Smędzik-Ambroży, K., Czyżewski, B., & Stępień, S. (2020). The economic sustainability of farms under the conditions of new agricultural policy. Sustainability, 12(3), 1242.

Gómez-Baggethun, E. (2015). Commodification. In D. D'Alisa, F. Demaria, & G. Kallis (Eds.), Degrowth: A vocabulary for a new era (pp. 59–62). Routledge.

Graeub, B. E., Chappell, M. J., Wittman, H., Ledermann, S., Kerr, R. B., & Gemmill-Herren, B. (2016). The state of family farms in the world. World Development, 87, 1–15. https://doi.org/10.1016/j.worlddev.2015.05.012

Gulan, B. (2010). Ko su vlasnici najviše zemlje u Srbiji [Who owns the most land in Serbia]. Novi Sad: Dnevnik-Poljoprivrednik.

Guth, M., Smędzik-Ambroży, K., Czyżewski, B., & Stępień, S. (2020). The economic sustainability of farms under the Common Agricultural Policy in the EU. Sustainability, 12(16), 6513. https://doi.org/10.3390/su12166513

Guy, K., et al. (2017). Distributional effects of CAP direct payments. European Commission, Joint Research Centre.

Guyomard, H., Bureau, J.-C., Chatellier, V., & Jacquet, F. (2023). The Common Agricultural Policy and the European Green Deal: The challenge of coherence. EuroChoices, 22(1), 18–25.

Helfrich, S., & Bollier, D. (Eds.). (2015). Patterns of commoning. Offshoot Books.

Hickel, J. (2021). Less is more: How degrowth will save the world. London: Penguin Random House.

Institute for Political Ecology. (2018). Commons in Southeast Europe. IPE.

Institute for Political Ecology. (2020). Environmental justice in Southeast Europe. IPE.

Josipović, D. (2021). Agrarian restructuring and the disappearance of small farms in Croatia. Sociologija i prostor, 59(2), 145–168.

Kallis, Giorgos & Kostakis, Vasilis & Lange, Steffen & Muraca, Barbara & Paulson, Susan & Schmelzer, Matthias. (2018). Research On Degrowth. Annual Review of Environment and Resources. 43. 10.1146/annurev-environ-102017-025941.

Kay, S., Peuch, J., & Franco, J. C. (2015). Extremely concentrated and unequal: New insights into the EU land concentration crisis. Transnational Institute.

Kušić K (2022) Land and human-soil relations in Southeast Europe, in: Connections. A Journal for Historians and Area Specialists, 18.11.2022.

Deiana, MA and Kušić K (2025) "No Alternative but Europeanisation: Slow Violence and Critical Imaginaries in/from/with South East Europe." In Aparna K, Krivonos D, and Pascucci E (eds) Europeanisation as Violence: Souths and Easts as Method. Manchester: Manchester University Press.

Kušić K (2024) What's in a Land Grab?: Knowing Dispossession and Land in Southeast Europe. In: Felix Anderl (ed) Epistemologies of Land. Lanham: Rowman & Littlefield.

Lowder, S. K., Sánchez, M. V., & Bertini, R. (2021). Which farms feed the world and has farmland become more concentrated? World Development, 142, 105455.

Liegey, V., & Nelson, A. (2020). Exploring degrowth: A critical guide. Pluto Press.

Lowder, S. K., Sánchez, M. V., & Bertini, R. (2021). Which farms feed the world and has farmland become more concentrated? World Development, 142, 105455. https://doi.org/10.1016/j.worlddev.2021.105455

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Malek, Ž., & Verburg, P. H. (2021). Mapping global patterns of land-use decision-making. Global Environmental Change, 69, 102303.

Medarov, G. (2013). Land concentration, land grabbing and land conflicts in Europe: The case of Boynitsa in Bulgaria. Land concentration, 154.

Moore, J. W. (2003). Ecology and the rise of capitalism. Theory and Society, 32(3), 307–377.

Oprea, Anastasia & Velicu, Irina & Delibas, Hestia & Pedro, Sérgio. (2023). "We grow earth": performing eco-agrarian citizenship at the semi-periphery of Europe. Environmental Politics. 33. 1-21. 10.1080/09644016.2023.2293432.

Omar, Y. T., & Thorsøe, M. H. (2023). The EU Farm to Fork Strategy: A critical review of its governance and implications for sustainable food systems. Sustainability, 15(1), 1234.

Pe'er, G., Zinngrebe, Y., Moreira, F., Sirami, C., Schindler, S., Müller, R., Bontzorlos, V., Clough, D., Bezák, P., Bonn, A., Hansjürgens, B., Lomba, A., Moeckel, T., Passoni, G., Rouillard, J. J., Vries, W. de, & Lakner, S. (2019). A greener path for the EU Common Agricultural Policy. Science, 365(6452), 449–451. https://doi.org/10.1126/science.aax3146

Pe'er, G., et al. (2019). Action needed for the EU Common Agricultural Policy to address sustainability challenges. People and Nature, 1(2), 316–333.

Savini, F. (2021). The urbanization of the countryside: From land grabbing to neoliberal rural development. Urban Studies, 58(12), 2467–2484.

Srećković, M. (2013). Land grabbing in Serbia. In FIAN International (Ed.), Land concentration, land grabbing and people's struggles in Europe. FIAN International.

Swinnen, J.F.M. (2009) The Growth of Agricultural Protection in Europe in the 19th and 20th Centuries. The World Economy, 32, 1499-1537.

http://dx.doi.org/10.1111/j.1467-9701.2009.01247.x

Transnational Institute (TNI). (2015). Land concentration, land grabbing and people's struggles in Europe. Transnational Institute.

Udovč, A. (2003). Structural changes and farm diversification in Slovenia. Acta Agriculturae Slovenica, 81(1), 119–126.

United Nations. (2018). United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (A/RES/73/165).

Varvarousis, A., March, H., & Kallis, G. (2025). Degrowth's rural front: Spatial politics of post-growth transitions. Journal of Rural Studies, 104, 103005.

Velicu, I. & Ogrezeanu, A. . (2022). Quiet no more: The emergence of food justice and sovereignty in Romania. Journal of Rural Studies. 89. 122-129. 10.1016/j.jrurstud.2021.11.024.

World Bank. (2022). World development indicators. World Bank.

Yang, X., & He, Q. (2021). Global land grabbing: A critical review of case studies across the world. Land, 10(3), 324. https://doi.org/10.3390/land10030324

Case study 5

Altenburg, T. and Rodrik, D. (2017). Green Industrial Policy: accelerating structural change towards resource efficiency. In C. Leader (ed.) *Handbook of Green Economy*. Routledge.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Ahumada, J. M. and Chang, H.-J. (2025). A new international economic order for the twenty-first century: An agenda for industrial and trade policies from the Global South. *Review of Keynesian Economics*, 13(4), 562-580.

Ahumada, J. M., and Sossdorf, F. (2025). A progressive industrial policy for the Global South: A Latin American perspective. *Social Europe*. https://www.socialeurope.eu/a-progressive-industrial-policy-for-the-global-south-a-latin-american-perspective

Chavez, D. (2024). Uruguay's Renewables Revolution: Changing Winds. In Robbins, P., Bozuwa, J., Lenferna, A., Chavez, D., Hayes, C., Brusseler, M., and Debregeas, A. (2024). *Who owns power in the energy transition?* New York: Climate and Community Project.

Climate Action Tracker. (2024). Costa Rica electricity generation mix. https://climateactiontracker.org

ECLAC (2023). *Economic Survey of Latin America and the Caribbean 2023: Financing a sustainable transition: Investment for growth and climate change action*. Santiago: Economic Commission for Latin America and the Caribbean. https://www.cepal.org/en/publications/67990-economic-survey-latin-america-and-caribbean-2023-financing-sustainable-transition

ECLAC (2024). *Economic Survey of Latin America and the Caribbean, 2024: Low-growth trap, climate change and employment trends*. Santiago: Economic Commission for Latin America and the Caribbean. https://www.cepal.org/en/publications/80596-economic-survey-latin-america-and-caribbean-2024-low-growth-trap-climate-change

Earth.org. (2025). Uruguay's renewable energy success. https://earth.org/uruguay-renewable-energy/

Estevez, I. and Riofrancos, T. (2025). Global Green Industrial Policy: Navigating Power Dynamics for a Pro-Working-Class, Pro-Development Green Transformation. Climate and Community Institute.

Gabor, D. and Sylla, N. S. (2023). Derisking developmentalism: A tale of green hydrogen. *Development and Change*, 54(5), 1169-1196.

Gobierno de México. (2025). Plan México: Estrategia Nacional de Industrialización y Prosperidad Compartida. https://www.planmexico.gob.mx/

Gudynas, E. (2016). Beyond varieties of development: Disputes and alternatives. *Third World Quarterly*, 37(4), 721-732.

Hamouchene, H. and Sandwell, K. (eds.). (2024). *Dismantling Green Colonialism: Energy and climate justice in the Arab region*. London: Pluto Press and Transnational Institute.

IPCC (2023). Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report. IPCC.

Juskus, R. (2023). Sacrifice zones: A genealogy and analysis of an environmental justice concept. *Environmental Humanities*, 15(1), 3-24.

Kulfas, M. (2025). *Producir en la nueva globalización*. Mexico City: Siglo XXI Editores.

Kulfas, M. and Schapiro, M. (2025). América Latina ante la nueva globalización. *Nueva Sociedad*, 319, 37-43.

Landerretche, O., Briones, I., Bergoeing, R., and Butelmann, A. (2024). Hacia un pacto de desarrollo: 13 verdades incómodas para una agenda de reformas radicales. Santiago: ICARE.

Lebdioui, A. (2024). *Survival of the greenest: Economic transformation in a climate-conscious world*. Cambridge: Cambridge University Press.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Low Carbon Power. (2025). Costa Rica electricity generation mix 2024/2025. https://lowcarbonpower.org/region/Costa_Rica

Mazzucato, M. (2018). Mission-oriented innovation policies: Challenges and opportunities. *Industrial and Corporate Change*, 27(5), 803-815.

Mazzucato, M. (2025). Governing the economics of the common good: From correcting market failures to shaping collective goals. *Journal of Institutional Economics*, 21(3), 477-499.

Mazzucato, M. and Rodrik, D. (2023). Industrial policy with conditionalities: A taxonomy and sample cases. IIPP WP 2023-07. UCL Institute for Innovation and Public Purpose.

Ministério da Fazenda. (2024). Nova Indústria Brasil. https://www.gov.br/fazenda/pt-br/acesso-a-informacao/acoes-e-programas/transformacao-ecologica/programas-em-destaque/nova-industria-brasil

Müller, B., Ghiotto, L., and Bárcena, L. (2024). The Raw Materials Rush: How the European Union is using trade agreements to secure supply of critical raw materials for its green transition. Amsterdam: Transnational Institute (TNI).

Nem Singh, J. T. (2024). *Business of the State: Why state ownership matters for resource governance*. Oxford: Oxford University Press.

Palma, J. G. (2025). Four sources of deindustrialisation and a new concept of the Dutch disease. In J. A. Ocampo (ed.) *Beyond Reforms: Structural dynamics and macroeconomic vulnerability*. Stanford: Stanford University Press and World Bank.

Reis Maria, M., Rocha, M.A., Montalvão, I., and Moura Breda, D. (2025). Política industrial verde e mudança estrutural para transição ecológica no Brasil. Campinas: Transforma Unicamp and Friedrich-Ebert-Stiftung.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., III, Lambin, E. F., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., de Wit, C. A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R. W., Fabry, V. J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., and Foley, J. A. (2009). A safe operating space for humanity. *Nature*, 461(7263), 472-475.

Sanchez-Lopez, M. D. (2023). Geopolitics of the Li-ion battery value chain and the Lithium Triangle in South America. *Latin American Policy*, 14(1), 67-91.

Schmitz, H. (2015). Green transformation: Is there a fast track? In I. Scoones, M. Leach, and P. Newell (eds.), The Politics of Green Transformations. New York: Routledge.

Svampa, M. (2019). *Neo-extractivism in Latin America: Socio-environmental conflicts, the territorial turn, and new political narratives*. Cambridge: Cambridge University Press.

U.S. International Trade Administration. (2024). Uruguay—Energy. https://www.trade.gov/country-commercial-guides/uruguay-energy

WEF (2023). Lithium and Latin America are key to the energy transition. World Economic Forum. https://www.weforum.org/stories/2023/01/lithium-latin-america-energy-transition

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Amsden, A. H. (1992). *Asia's Next Giant: South Korea and Late Industrialisation*. Oxford: Oxford University Press.

ASEAN Centre for Energy. (2021, April 13). Vietnam smashes 2020 solar capacity records. https://aseanenergy.org/vietnam-smashes-2020-solar-capacity-records/

Asian Development Bank. (n.d.). Alternative Energy Development Plan, 2015–2036 (Thailand): ADB's Law and Policy Reform Program. https://lpr.adb.org/resource/alternative-energy-development-plan-2015-2036-thailand

Do, T. N., and Sharma, D. (2020). Underlying drivers and barriers for solar photovoltaics diffusion: The case of Vietnam. *Energy Policy*, 144, 111561. https://doi.org/10.1016/j.enpol.2020.111561

Doner, R. F., Noble, G. W., and Ravenhill, J. (2021). *The Political Economy of Automotive Industrialisation in East Asia*. Oxford: Oxford University Press.

Farrell, H., and Newman, A. L. (2019). Weaponised Interdependence: How Global Economic Networks Shape State Coercion. International Security, 44(1), 42–79. https://doi.org/10.1162/isec_a_00351

Juhász, R., Lane, N., and Rodrik, D. (2024). The new economics of industrial policy. *Annual Review of Economics*, 16, 213-242. https://doi.org/10.1146/annurev-economics-081023-024638

Natsuda, K., and Thoburn, J. (2021). *Automotive Industrialisation: Industrial Policy and Development in Southeast Asia*. New York: Routledge.

Nem Singh, J. T. (2023). The advance of the state and the renewal of industrial policy in the age of strategic competition. *Third World Quarterly*, 44(11), 2527–2545. https://doi.org/10.1080/01436597.2023.2217766

Nem Singh, J. T., Ngamarunchot, B., and Somsiriwong, P. (2025). Green industrial policy in Asia Pacific and the global supply chain: A dynamic exchange of ideas for a sustainable future. Transnational Institute. https://www.tni.org/en/article/green-industrial-policy-in-asia-pacific-and-the-global-supply-chain

Noman, A., and Stiglitz, J. E. (eds.). (2017). *Efficiency, Finance, and Varieties of Industrial Policy: Guiding resources, learning and technology for sustained growth*. New York: Columbia University Press.

Oqubay, A., Cramer, C., Chang, H.-J., and Kozul-Wright, R. (Eds.). (2020). *The Oxford Handbook of Industrial Policy*. Oxford: Oxford University Press.

Vietnam Briefing. (2023, January 17). Feed-in tariffs for solar and wind power projects in Vietnam. https://www.vietnam-briefing.com/news/feed-in-tariffs-solar-wind-vietnam.html

Wade, R. H. (1990). *Governing the Market: Economic theory and the role of government in East Asian industrialisation*. Princeton: Princeton University Press.

World Bank. (2021). *Vietnam poverty assessment: Strengthening inclusive growth*. Washington DC: World Bank Group.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Case study 7

Asiama, R., Avenyo, E., Habiyaremye, A., Ncube, P., and Tregenna, F. (2025). The new era of industrial policy in Africa: From SDG perspective. Vienna: United Nations Industrial Development Organization.

Bhorat, H., Kupeta, T., Martin, L., Collins, S., and Steenkamp, F. (2024). Just Transition and the Labour Market in South Africa: Measuring Individual and Household Coal Economy Dependence. Cape Town: Development Policy Research Unit (DPRU), University of Cape Town.

Chang, H.-J. (2002). *Kicking Away the Ladder: Development Strategy in Historical Perspective*. London: Anthem Press.

Chavez, D. and Steinfort, L. (2022). The future is public! The global reclaiming and democratisation of public ownership beyond the market. *Development*, 65(2), 207-216. https://doi.org/10.1057/s41301-022-00350-3

Cherif, R. and Hasanov, F. (2019). The return of the policy that shall not be named: Principles of industrial policy. IMF Working Paper 19/74. Washington, DC: International Monetary Fund.

Hamouchene, H. and Sandwell, K. (eds.). (2023). *Dismantling Green Colonialism: Energy and Climate Justice in the Arab Region*. London: Pluto Press and Transnational Institute.

Lebdioui, A., and Riofrancos, T. (2025). Critical minerals and resource nationalism 2.0: Why the policy is more critical than the mineral. Oxford: Technology and Industrialisation for Development (TIDE) Centre, University of Oxford.

Presidential Climate Commission. (2022). A just transition framework for South Africa. Pretoria: Department of Energy, Government of South Africa.

Rodrik, D. (2008). *One Economics, Many Recipes: Globalisation, Institutions, and Economic Growth*. Princeton, NJ: Princeton University Press.

Stiglitz, J. E. (2010). *Freefall: America, Free Markets and the Sinking of the World Economy*. New York: W.W. Norton & Company.

UNCTAD. (2023). *Trade and Development Report 2023. Growth, Debt and Climate: Realigning the Global Financial Architecture*. Geneva: United Nations Conference on Trade and Development.

Case study 8

African Development Bank (2024). Global Gateway: EU-Africa partnership on infrastructure. Press Release, February 1, 2024.

Arab Reform Initiative (2024). Unpacking just transition: Conception, civil society, and governance in Tunisia's energy pathway. https://www.arab-reform.net/publication/will-tunisia-escape-green-colonialism/

BloombergNEF. (2024). Africa Power Transition Factbook 2024. https://assets.bbhub.io/professional/sites/24/Africa-Power-Transition-Factbook-2024.pdf

Climate Change News (2025, January 31). EU backs North Africa hydrogen pipeline but experts urge caution. https://www.climatechangenews.com/2025/01/31/eu-backs-north-africa-hydrogen-pipeline-but-is-it-a-green-dream/

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

European Commission (2023). Carbon Border Adjustment Mechanism Regulation (EU) 2023/956. Brussels: Official Journal of the European Union.

European Commission (2024). EU Energy Security strategy. Brussels: Commission Strategic Document.

Energy Capital Power (2025, September 5). Egypt to double power sector investments to EGP 136.3B in 2025/26. https://energycapitalpower.com/egypt-to-double-power-sector-investments-to-egp-136-3b-in-2025-26/

European Commission (2020). A hydrogen strategy for a climate-neutral Europe. https://energy.ec.europa.eu/system/files/2020-07/hydrogen_strategy_0.pdf

Green Hydrogen Organisation (2025). Morocco. https://gh2.org/countries/morocco

International Energy Agency (2024). World energy investment 2024: Africa. https://www.iea.org/reports/world-energy-investment-2024/africa

International Renewable Energy Agency (2023). North Africa: Policies and finance for renewable energy deployment. https://www.irena.org/Publications/2023/Dec/North-Africa-policies-and-finance-for-renewable-energy

Modern Diplomacy (2025, October 16). Hydrogen in Western Sahara: Greenwashing the occupation, fuelling injustice. https://moderndiplomacy.eu/2025/10/16/hydrogen-in-western-sahara-greenwashing-the-occupation-fuelling-injustice/

Morocco World News (2025a, March 6). Morocco selects five investors for $31.9 billion green hydrogen projects. https://www.moroccoworldnews.com/2025/03/180650/morocco-selects-five-investors-for-31-9-billion-green-hydrogen-projects/

Morocco World News (2025b, October 7). Germany, Netherlands, Czech Republic back Morocco's green hydrogen push. https://www.moroccoworldnews.com/2025/10/261769/germany-netherlands-czech-republic-back-moroccos-green-hydrogen-push/

Morison, R. (2024, October 9). Europe-North Africa interconnectors could support 24GW of renewable energy capacity. PV Tech. https://www.pv-tech.org/europe-north-africa-interconnectors-could-support-24gw-of-renewable-energy-capacity/

Saharawi Observatory for Natural Resources and Environmental Protection (2025). Sustainability for whom? Western Sahara renewable energy and environmental justice under occupation. https://www.spsrasd.info/en/2025/06/24/10436.html

SouthH2 Corridor Project Consortium. (2025). The SouthH2 Corridor: bridging hydrogen supply gap in Europe. Project Overview Document. https://www.south2corridor.net/

U.S. International Trade Administration (2024). Tunisia: Electrical power systems and renewable energy. https://www.trade.gov/country-commercial-guides/tunisia-electrical-power-systems-and-renewable-energy

U.S. International Trade Administration (2025). Egypt: Electricity and renewable energy. https://www.trade.gov/country-commercial-guides/egypt-electricity-and-renewable-energy

Western Sahara Resource Watch (2023). Moroccan government reveals energy gigaplans in occupied territory. https://wsrw.org/en/news/moroccan-gov-reveals-energy-gigaplans-in-ot

World Bank (2018). Arab Republic of Egypt: Providing affordable clean energy. https://www.worldbank.org/en/about/partners/brief/arab-republic-of-egypt-providing-affordable-clean-energy

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

World Bank (2024a). Green energy production in Tunisia: The World Bank Group assistance. https://www.worldbank.org/en/programs/teri/brief/green-affordable-and-viable-energy-production-tunisia

World Bank (2024b). Climate action: A catalyst for Egypt's prosperity and sustainable growth. https://www.worldbank.org/en/news/feature/2024/11/25/climate-action-a-catalyst-for-egypts-prosperity-and-sustainable-growth

World Bank (2025, November 11). World Bank approves new project to power Tunisia's energy transformation. Press release. https://www.worldbank.org/en/news/press-release/2025/11/11/world-bank-approves-new-project-to-power-tunisia-s-energy-transformation

World Economic Forum (2024, April). Stepping up renewable energy capacity in the MENA region. https://www.weforum.org/stories/2024/04/renewable-energy-capacity-mena/

Case study 9

Charron, N., Lapuente, V., and Bauhr, M. (2024). "The Geography of Quality of Government in Europe. Subnational variations in the 2024 European Quality of Government Index and Comparisons with Previous Rounds". QoG Working Paper Series 2024:2. Department of Political Science, University of Gothenburg.

Dafermos, Y. (2025). Climate finance and global justice. Climate Policy, 1–17. https://doi.org/10.1080/14693062.2025.2482104

Dijkstra, L., Poelman, H., and Veneri, P. (2019). "The EU-OECD definition of a functional urban area", OECD Regional Development Working Papers, Nº 2019/11. Paris: OECD Publishing.

EC (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Sustainable Europe Investment Plan. European Green Deal Investment Plan. Brussels. EC. https://eur-lex.europa.eu/legal- content/En/TXT/HTML/?uri=CELEX:52020DC0021

EC (2025a) The European Green Deal: Striving to be the first climate-neutral continent. Brussels. EC. https://commission.europa.eu/strategy-and-policy/priorities- 2019-2024/european-green-deal_en

EC (2025b) The Just Transition Mechanism: making sure no-one is left behind. Brussels: EC. https://commission.europa.eu/strategy-and-policy/priorities-2019- 2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

EC (2025c) Omnibus I package. Brussels. EC. https://finance.ec.europa.eu/publications/omnibus-i-package-commission-simplifies- rules-sustainability-and-eu-investments-delivering-over-eu6_en

EIB (2020) EIB Group Climate Bank Roadmap 2021-2025. Luxembourg: EIB. https://www.eib.org/en/publications/the-eib-group-climate-bank-roadmap

EIB (2021-2023) Climate action and sustainability figures for 2021/2022/2023. Luxembourg: EIB. https://www.eib.org/en/registers/all/index.htm?q=&sortColumn=publicationDate&sortDir=desc&pageNumber=0&itemPerPage=10&pageable=true&la=EN&deLa=EN&yearFrom=&orYearFrom=true&yearTo=&orYearTo=true&orDocumentLanguages=true&documentTypes=CLIMATEACTIONDATA&orDocumentTypes=true

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

EIB (2022) Supporting the Just Transition Mechanism. Luxembourg. EIB. https://www.eib.org/files/publications/supporting_the_just_transition_mechanism_en.pdf

EIB (2024) Climate action and environmental sustainability overview. Luxembourg. EIB. https://www.eib.org/attachments/lucalli/20240051_climate_action_and_enviromental_sustainability_overview_2024_en.pdf

EIB (2025) Municipalities Survey 2024–2025. Luxembourg. EIB. https://www.eib.org/en/publications/20250028-eib-municipalities-survey-2024-2025

Eurostat (2025a). NUTS – Nomenclature of Territorial Units for Statistics. Available at: https://ec.europa.eu/eurostat/web/nuts

Eurostat (2025b). Population on 1 January by age group, sex and NUTS 2 region. https://ec.europa.eu/eurostat/databrowser/view/demo_r_pjangroup/default/table?lang=en&category=reg.reg_dem.reg_dempoar

Eurostat (2025c). Territorial typologies manual – cities, commuting zones and functional urban areas. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Territorial_typologies_manual_-_cities,_commuting_zones_and_functional_urban_areas

Eurostat (2025d). Population on 1 January by age groups and sex – functional urban areas. Available at: https://ec.europa.eu/eurostat/databrowser/view/urb_lpop1/default/table?lang=en&category=urb.urb_luz

Eurostat (2025e). Population on 1 January by five-year age group, sex and metropolitan region. Available at: https://ec.europa.eu/eurostat/databrowser/view/met_pjangrp3/default/table?lang=en&category=reg_typ.met.met_demo

Eurostat (2025f). Gross domestic product (GDP) at current market prices by NUTS 2 region. Available at: https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en&category=reg.reg_eco10.reg_eco10gdp

Kavvadia, H. (2021) "The European Investment Bank's 'Quantum Leap' to Become the World's First International Climate Bank". Politics and Governance. Vol 9 (2). DOI: https://doi.org/10.17645/pag.v9i2.3921

O'Brien, K. L., and Leichenko, R. M. "Winners and Losers in the Context of Global Change." Annals of the Association of American Geographers 93, no. 1 (2003): 89–103. http://www.jstor.org/stable/1515325.

OECD (2025) Mobilising sustainable finance for regions and cities. OECD Regional Development Papers. Paris: OECD.

Rodríguez-Pose, A. and Bartalucci, F. (2024) The green transition and its potential territorial discontents, Cambridge Journal of Regions, Economy and Society, Volume 17, Issue 2, July, 339–358, https://doi.org/10.1093/cjres/rsad039

UN (2025) 2030 Agenda for Sustainable Development. "Leaving no one behind". New York. UN. https://www.un.org/en/desa/leaving-no-one-behind

UNEP (2025a) Cities and climate change. https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities-and-climate-change

UNEP (2025b) Green Financing. New York: UN. https://www.unep.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/green-financing

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Yeung, P. (2025) Where is the money the EU promised workers to go green? https://www.context.news/just-transition/where-is-the-money-the-eu-promised-workers- to-go-green?utm_source=email&utm_medium=email&utm_campaign=context-share

Zahnow, R., Yousefnia, A. R., Hassankhani, R. and Cheshmehzangi, A. (2025) Climate change inequalities: A systematic review of disparities in access to mitigation and adaptation measures, Environmental Science & Policy, 165, https://doi.org/10.1016/j.envsci.2025.104021.

Case study 10

Abbasi, G., & Bouman, E. A. (2020). Emissions outsourcing in the EU. *A Review of Potential Effects on Industrial Pollution. doi*, *10*.

Aichele, R., & Felbermayr, G. (2015). Kyoto and carbon leakage: An empirical analysis of the carbon content of bilateral trade. *Review of Economics and Statistics*, *97*(1), 104-115.

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American economic review*, *93*(1), 170-192.

Angelico, C. (2024). The green transition and firms' expectations on future prices: Survey evidence. *Journal of Economic Behavior & Organization*, *221*, 519–543.

Bagus, P., & Peña-Ramos, J. A. (2023). Energy security and the transition toward green energy production. *Energies* 2023, *16*(6), 2920; https://doi.org/10.3390/en16062920

Baran, J., Szpor, A., & Witajewski-Baltvilks, J. (2020). Low-carbon transition in a coal-producing country: A labour market perspective. Energy Policy, 147, 111878.

Bellora, C., & Fontagné, L. (2023). EU in search of a Carbon Border Adjustment Mechanism. *Energy Economics*, *123*, 106673.

Berry, A. (2019). The distributional effects of a carbon tax and its impact on fuel poverty: A microsimulation study in the french context. *Energy Policy*, *124*, 81–94.

Blanchet, T., Chancel, L., Flores, I., Morgan, M., Alvaredo, F., Atkinson, A., Bauluz, L., Fisher-Post, M., Garbinti, B., Goupille-Lebret, J., Mart´ınez-Toledano, C., Neef, T., Piketty, T., Robilliard, A.-S., Saez, E., Yang, L., & Zucman, G. (2024). *Distributional national accounts guidelines methods and concepts used in the world inequality database.*

Branger, F., & Quirion, P. (2014). Would border carbon adjustments prevent carbon leakage and heavy industry competitiveness losses? Insights from a meta-analysis of recent economic studies. *Ecological Economics*, *99*, 29-39.

Bray, R., Montero, A. M., & Ford, R. (2022). Skills deployment for a 'just'net zero energy transition. *Environmental Innovation and Societal Transitions*, *42*, 395–410.

Burtraw, D., Sweeney, R., & Walls, M. (2009). The incidence of us climate policy: Alternative uses of revenues from a cap-and-trade auction. *National Tax Journal*, *62* (3), 497–518.

Carattini, S., Baranzini, A., Thalmann, P., Varone, F., & Vöhringer, F. (2017). Green taxes in a post-paris world: Are millions of nays inevitable? *Environmental and resource economics*, *68*, 97–128.

Cha, J. M. (2017). A just transition: Why transitioning workers into a new clean energy economy should be at the center of climate change policies. *Fordham Environmental Law Review*, *29* (2), 196–220.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Chateau, J., R. Bibas and E. Lanzi (2018), "Impacts of Green Growth Policies on Labour Markets and Wage Income Distribution: A General Equilibrium Application to Climate and Energy Policies", *OECD Environment Working Papers*, No. 137, OECD Publishing, Paris, https://doi.org/10.1787/ea3696f4-en

Copeland, B. R., & Taylor, M. S. (1994). North-South Trade and the Environment. *The Quarterly Journal of Economics*, *109*(3), 755–787. https://doi.org/10.2307/2118421

Copeland, B. R., & Taylor, M. S. (2004). Trade, growth, and the environment. *Journal of Economic literature*, *42*(1), 7-71.

Chun, H. K. (2024). Falling through the cracks? skilling, reskilling and upskilling for job transitions. In *Rethinking economic transformation for sustainable and inclusive development* (pp. 205–234). Edward Elgar Publishing.

De Beule, F., Schoubben, F., & Struyfs, K. (2022). The pollution haven effect and investment leakage: The case of the EU-ETS. Economics Letters, 215, 110536.

Dechezleprêtre, A., Gennaioli, C., Martin, R., Muûls, M., & Stoerk, T. (2022). Searching for carbon leaks in multinational companies. *Journal of Environmental Economics and Management*, *112*, 102601.

Demiral, Ö., Demiral, M., & Aktekin-Gök, E. D. (2022). Extra-regional trade and consumption-based carbon dioxide emissions in the European countries: Is there a carbon leakage? *Sustainable Development*, *30*(6), 1987-2001.

Doctorow, C. (2022). *This "inflation" is different. new stiglitz just dropped.* [Accessed: 2025-05-27]. https://doctorow.medium.com/this-inflation-is-different-248b8538371b

Edenhofer, O., Kalkuhl, M., & Roolfs, C. (2021). Carbon pricing and revenue recycling: An overview of vertical and horizontal equity effects for germany. *CESifo Forum*, *22* (05), 10–14.

Eslahi, E., Creti, A., & Sanin, M. E. (2026). Mission accomplished? A post-assessment of EU ETS impact on power sector emissions reduction. *Ecological Economics*, *239*, 108784.

European Commission. (2019). *The European Green Deal*. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

Eurostat. (2025, July 21). *International trade in goods, by type of good*. Statistics Explained. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_trade_in_goods

Flues, F. and A. Thomas (2015), "The distributional effects of energy taxes", *OECD Taxation Working Papers*, No. 23, OECD Publishing, Paris, https://doi.org/10.1787/5js1qwkqqrbv-en.

Frondel, M., Sommer, S., & Vance, C. (2015). The burden of Germany's energy transition: An empirical analysis of distributional effects. *Economic Analysis and Policy*, *45*, 89–99.

Giangregorio, L. (2024). Welfare type and income inequality: An income source decomposition including in-kind benefits and cash-transfers entitlement. *International Tax and Public Finance*, *31* (2), 367–403.

Green, J. F. (2021). Does carbon pricing reduce emissions? A review of ex-post analyses. *Environmental Research Letters*, *16*(4), 043004.

Gubello, M., & Dunne, S. M. (2025). The political economy of in-kind versus cash redistribution in Europe. *International Tax and Public Finance*, 1-37.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Haug, C., Eden, A., & de Oca, M. M. (2018). Addressing the distributional impacts of carbon pricing policies. *Berlin: adelphi*.

Jianu, I. (2020). The impact of government health and education expenditure on income inequality in european union. *arXiv preprint arXiv:2007.11409*.

Juergens, I., Barreiro-Hurlé, J., & Vasa, A. (2013). Identifying carbon leakage sectors in the EU ETS and implications of results. *Climate policy*, *13*(1), 89-109.

Karagianni, S., & Pempetzoglou, M. (2022). The income distribution impact of decarbonization in greece: An initial approach. *Circular Economy and Sustainability*, *2* (2), 557–567.

Korzeniowska, A. M. (2021). Heterogeneity of government social spending in European Union countries. *Future Business Journal*, *7*(1), 38.

Koźluk, T. and C. Timiliotis (2016), "Do environmental policies affect global value chains?: A new perspective on the pollution haven hypothesis", *OECD Economics Department Working Papers*, No. 1282, OECD Publishing, Paris, https://doi.org/10.1787/5jm2hh7nf3wd-en.

Kyriacou, C., Fokaides, P. A., & Barbano, G. (2024). Deliverable D2. 1: Local CET plans framework, including stakeholders mapping and Skills Gap Analysis.

Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building Eora: a global multi-region input–output database at high country and sector resolution. *Economic Systems Research*, *25*(1), 20-49.

Liquete, C., Kleeschulte, S., Dige, G., Maes, J., Grizzetti, B., Olah, B., & Zulian, G. (2015). Mapping green infrastructure based on ecosystem services and ecological networks: A pan-european case study. *Environmental Science & Policy*, *54*, 268–280.

Nachmany, M., & Setzer, J. (2018). Policy brief global trends in climate change legislation and litigation: 2018 snapshot. *Grantham Research Institute on Climate Change and the Environment*.

Nachtigall, D., Lutz, L., Cárdenas Rodríguez, M. *et al.* The Climate Actions and Policies Measurement Framework: A Database to Monitor and Assess Countries' Mitigation Action. *Environ Resource Econ* 87, 191–217 (2024). https://doi.org/10.1007/s10640-023-00821-2

McWilliams, B., Tagliapietra, S., & Zettelmeyer, J. (2025). Reconciling the European Union's clean industrialisation goals with those of the Global South. In J. Pisani-Ferry, B. Weder di Mauro, & J. Zettelmeyer (Eds.), *Global action without global governance: Building coalitions for climate transition and nature restoration* (Paris Report 3, Chapter 6). Bruegel and CEPR.

Middlemiss, L. (2022). Who is vulnerable to energy poverty in the global north, and what is their experience? *Wiley Interdisciplinary Reviews: Energy and Environment*, *11* (6), e455.

Ohlendorf, N., Jakob, M., Minx, J. C., Schr¨oder, C., & Steckel, J. C. (2021). Distributional impacts of carbon pricing: A meta-analysis. *Environmental and Resource Economics*, *78*, 1–42.

Palm, W., Webb, E., Hern´andez-Quevedo, C., Scarpetti, G., Lessof, S., Siciliani, L., & van Ginneken, E. (2021). Gaps in coverage and access in the european union. *Health Policy*, *125* (3), 341–350.

Pauleit, S., Ambrose-Oji, B., Andersson, E., Anton, B., Buijs, A., Haase, D., Elands, B., Hansen, R., Kowarik, I., Kronenberg, J., et al. (2019). Advancing urban green infrastructure in europe: Outcomes and reflections from the green surge project. *Urban forestry & urban greening*, *40*, 4–16.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Pavloudakis, F., Karlopoulos, E., & Roumpos, C. (2023). Just transition governance to avoid socio-economic impacts of lignite phase-out: The case of western macedonia, greece. *The Extractive Industries and Society*, *14*, 101248.

Pen˜a-S´anchez, A. R., Ruiz-Chico, J., & Jim´enez-Garc´ıa, M. (2021). Dynamics of public spending on health and socio-economic development in the european union: An analysis from the perspective of the sustainable development goals. *Healthcare*, *9* (3), 353.

Pesaran, M. H., & Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of econometrics*, *142* (1), 50–93.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, *61*(S1), 653-670.

Piermartini, Roberta and Yotov, Yoto, Estimating Trade Policy Effects with Structural Gravity (July 27, 2016). CESifo Working Paper Series No. 6009. http://dx.doi.org/10.2139/ssrn.2828613

IEA (2008), *Climate Policy and Carbon Leakage*, IEA, Paris https://www.iea.org/reports/climate-policy-and-carbon-leakage

Ru¨b, D. (2024). Inequality beyond income quantiles: Distributional effects of climate mitigation policies. *Ecological Economics*, *216*, 108019.

Rud, J.-P., Simmons, M., Toews, G., & Aragon, F. (2024). Job displacement costs of phasing out coal. *Journal of Public Economics*, *236*, 105167.

Sadik-Zada, E. R., & Ferrari, M. (2020). Environmental policy stringency, technical progress and pollution haven hypothesis. *Sustainability*, *12*(9), 3880.

Saussay, A., & Zugravu-Soilita, N. (2023). International production chains and the pollution offshoring hypothesis: An empirical investigation. *Resource and Energy Economics*, *73*, 101357.

Seo, H. (2021). 'dual'labour market? patterns of segmentation in european labour markets and the varieties of precariousness. *Transfer: European review of labour and research*, *27* (4), 485–503.

Sterner, T. (2012). Distributional effects of taxing transport fuel. *Energy Policy*, *41*, 75–83.

Sun, X., Mi, Z., Cheng, L., Coffman, D. M., & Liu, Y. (2024). The carbon border adjustment mechanism is inefficient in addressing carbon leakage and results in unfair welfare losses. *Fundamental Research*, *4*(3), 660-670.

Tan, X., Liu, Y., Cui, J., & Su, B. (2018). Assessment of carbon leakage by channels: An approach combining CGE model and decomposition analysis. *Energy Economics*, *74*, 535-545.

Thomsen, S. F. (2021). The impact of environmental regulations on competitiveness and carbon leakage. *European Journal of Economics and Economic Policies. Advance Access Articles.*

Ugrinov, S. (2025). The effects of environmental taxes on environmental pollution in the member states of the European Union. *Economic Systems*, 101308.

Verde, S. F. (2020). The impact of the EU emissions trading system on competitiveness and carbon leakage: the econometric evidence. *Journal of economic surveys*, *34*(2), 320-343.

Verdolini, E., Look, W., Belpietro, C., & Persico, G. (2024). The European Union policy toolbox to support just transition. *Report No.: 24*, *2*.

Voicu-Dorobant, u, R., Volintiru, C., Popescu, M.-F., Ner˘au, V., & S, tefan, G. (2021). Tackling complexity of the just transition in the EU: Evidence from Romania. *Energies*, *14* (5), 1509.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Wang, M., & Kuusi, T. (2024). Trade flows, carbon leakage, and the EU Emissions Trading System. *Energy Economics*, *134*, 107556.

Wang, Q., Hubacek, K., Feng, K., Wei, Y.-M., & Liang, Q.-M. (2016). Distributional effects of carbon taxation. Applied energy, 184, 1123–1131.

Westerlund, J. (2008). Panel cointegration tests of the Fisher effect. *Journal of applied econometrics*, *23*(2), 193-233.

Wier, M., Birr-Pedersen, K., Jacobsen, H. K., & Klok, J. (2005). Are co2 taxes regressive? evidence from the danish experience. *Ecological economics*, *52* (2), 239–251.

Zachmann, G., Fredriksson, G., & Claeys, G. (2022). *Distributional effects of climate policies.*

Ziemblińska, K., Urbaniak, M., Jinlong, H., Olejnik, J., & Kundzewicz, Z. W. (2025). Decoupling of economic growth and CO2 emissions in 11 European Union Member States in Central and Eastern Europe. *Sustainable Energy Technologies and Assessments*, *82*, 104482.

Case study 11

Allan, J., Lemaadel, M., & Lakhal, H. (2022). Oppressive energopolitics in Africa's last colony: Energy, subjectivities, and resistance. *Antipode*, *54*(1), 44-63.

Akhtar, M. S., Khan, H., Liu, J. J., & Na, J. (2023). Green hydrogen and sustainable development–a social LCA perspective highlighting social hotspots and geopolitical implications of the future hydrogen economy. *Journal of Cleaner Production*, *395*, 136438.

Anderson, B., Cammeraat, E., Dechezleprêtre, A., Dressler, L., Gonne, N., Lalanne, G., ... & Theodoropoulos, K. (2023). Designing policy packages for a climate-neutral industry: A case study from the Netherlands. *Ecological Economics*, *205*, 107720.

Amnesty International (2021, March 18). *Morocco/Western-Sahara: Sahrawi activist abused under house arrest: Sultana Khaya.* Amnesty International. https://www.amnesty.org/en/documents/mde29/3815/2021/en/

Aoulouhaj, A. (2025, June 6). *The German Development Bank gives the Noor I power plant in Ouarzazate a resounding thumbs up*. Atalyar. https://www.atalayar.com/en/articulo/economy-and-business/the-german-development-bank-gives-the-noor-i-power-plant-in-ouarzazate-resounding-thumbs-up/20250625100000216224.html

Apergi, M., Eicke, L., Goldthau, A., Hashem, M., Huneeus, S., de Oliveira, R. L., ... & Veit, K. (2024). An energy justice index for the energy transition in the global South. *Renewable and Sustainable Energy Reviews*, *192*, 114238.

Associated Press. (2025, October 31). *UN approves resolution supporting Morocco's claim to Western Sahara*. The Guardian. https://www.theguardian.com/world/2025/oct/31/un-approves-resolution-supporting-moroccos-claim-to-western-sahara

Azemzi, H. (2025). Governance and policy approaches for addressing water scarcity: insights from Morocco. *Euro-Mediterranean Journal for Environmental Integration*, 1-12.

Bauer, C., Treyer, K., Antonini, C., Bergerson, J., Gazzani, M., Gencer, E., ... & Van der Spek, M. (2022). On the climate impacts of blue hydrogen production. *Sustainable Energy & Fuels*, *6*(1), 66-75.

Baker, E., Carley, S., Castellanos, S., Nock, D., Bozeman III, J. F., Konisky, D., ... & Sovacool, B. (2023). Metrics for decision-making in energy justice. *Annual Review of Environment and Resources*, *48*(1), 737-760.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Bindi, J., Bartolomei, F., Pellegrini-Masini, G., Agostini, A., & Padovan, D. (2025). Assessing social impacts and Energy Justice along green hydrogen supply chains: a capability-based framework. *Energy Research & Social Science*, *126*, 104149.

Centraal Bureau voor de Statistiek (CBS) (2025, September 30). *Eindverbruikersprijzen aardgas en elektriciteit*. CBS. https://opendata.cbs.nl/#/CBS/nl/dataset/85666NED/table

European Commission and Council of the European Union v Front populaire pour la libération de la Saguia el-Hamra et du Rio de oro (Front Polisario). Judgment of the Court (Grand Chamber) of 4 October 2024. ECLI:EU:C:2024:835.

Commission delegated regulation (EU) specifying a methodology for assessing greenhouse gas emissions savings from low- carbon fuels Brussels, (8.7.2025C(2025) 4674 final)

Collins, L. (2025, April 25) *Billions of euros allocated, but only 21% of green hydrogen projects awarded IPCEI funding by EU have reached FID*. Hydrogen Insight. https://www.hydrogeninsight.com/policy/billions-of-euros-allocated-but-only-21-of-green-hydrogen-projects-awarded-ipcei-funding-by-eu-have-reached-fid/2-1-1811477

Dillman, K. J., & Heinonen, J. (2022). A 'just'hydrogen economy: a normative energy justice assessment of the hydrogen economy. *Renewable and Sustainable Energy Reviews*, *167*, 112648.

Directive 2023/2413. *Directive (EU) No. 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources*. http://data.europa.eu/eli/dir/2023/2413/oj

Directive 2024/1788. *Directive (EU) No 2024/1788 of the European Parliament and of the Council of 13 June 2024 on common rules for the internal markets for renewable gas, natural gas and hydrogen.* http://data.europa.eu/eli/dir/2024/1788/oj

dos Reis, R. A., Rangel, G. P., & Neto, B. (2024). Social life cycle assessment of green hydrogen production: Evaluating a projected Portuguese industrial production plant. *Renewable Energy*, *235*, 121293.

de Kleer, D., van Teutem, S., & De Vries, C. E. (2024). Public support for pro-climate and counter-climate protests. *Open Sci Framew*, 1-93.

European Commission (2020, July 8). *Communication from the Commission to the European parliament, the Council, the European economic and social committee and the Committee of the regions: A hydrogen strategy for a climate-neutral Europe*. (Report: COM(2020) 301 final) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52020DC0301

European Commission (2022, May 18). *Communication from the Commission to the European parliament, the Council, the European economic and social committee and the Committee of the regions:* REPowerEU Plan (Report COM/2022/230 final)

European Commission (no date). *Renewable hydrogen*. European Commission, Directorate-General for Communication. https://energy.ec.europa.eu/topics/eus-energy-system/hydrogen/renewable-hydrogen_en

Faouzi, A. (2025, October 3). *Germany, Netherlands, Czech Republic Back Morocco's Green Hydrogen Push.* Morocco World News. https://www.moroccoworldnews.com/2025/10/261769/germany-netherlands-czech-republic-back-moroccos-green-hydrogen-push/

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Fladvad, B. (2023). Infrastructuring environmental (in) justice: green hydrogen, Indigenous sovereignty and the political geographies of energy technologies. *Geographica Helvetica*, *78*(4), 493-505.

Gómez, A. F., & Rehage, R. (2024). Is Public Participation in Hydrogen Matters (Un) just? Evaluating the Ex-/inclusion of the Vulnerable and Marginalised Individuals in the Hydrogen Decision-Chains of the EU, Spain and Germany. *Journal for European Environmental & Planning Law*, *21*(3-4), 318-342.

Fortier, M. O. P., Teron, L., Reames, T. G., Munardy, D. T., & Sullivan, B. M. (2019). Introduction to evaluating energy justice across the life cycle: A social life cycle assessment approach. Applied energy, 236, 211-219.

Fraser, N. (2008). Social justice in the age of identity politics: Redistribution, recognition, and participation. In *Geographic thought* (pp. 72-89). Routledge.

Green Hydrogen Organisation. (no date). *Morocco*. Gh2.org. https://gh2.org/countries/morocco#:~:text=Green%20hydrogen%20vision,ammonia%20imports%20with%20local%20production

Haag, L. (2022). Environmental colonialism in the Maghreb? Harnessing green energy on indigenous peoples' land. *The Swedish Institute of International Affairs*.

Hamouchene, H. (2023). *Dismantling Green Colonialism: Energy and Climate Justice in the Arab Regio*. Pluto Press.

Head of Government (2024, March 11) *Implementation of the Morocco Offer for the development of the green hydrogen sector(s)*. Kingdom of Morocco. https://www.masen.ma/en/green-hydrogen-moroccan-offer

Heffron, R. J., McCauley, D., & Sovacool, B. K. (2015). Resolving society's energy trilemma through the Energy Justice Metric. *Energy Policy*, *87*, 168-176.

Hermans, S.T.M. (2025a, February 18). *Kamerbrief met reactie op moties over de jaarverplichting RFNBO's in industrie* [Letter of Government] Ministerie van Klimaat en Groene Groei. https://www.rijksoverheid.nl/documenten/kamerstukken/2025/02/18/kamerbrief-moties-van-de-leden-erkens-en-flach-inzake-de-jaarverplichting-rfnbo-s-in-industrie

Hermans, S.T.M. (2025b, September 16). *Aanbiedingsbrief bij Actieplan windenergie op zee.* [Letter of Government] Ministerie van Klimaat en Groene Groei. https://www.rijksoverheid.nl/documenten/kamerstukken/2025/09/16/actieplan-windenergie-op-zee

Howarth, R. W., & Jacobson, M. Z. (2021). How green is blue hydrogen?. *Energy Science & Engineering*, *9*(10), 1676-1687.

Hulshof, D., & Mulder, M. (2022). Design of Renewable Support Schemes and Windfall Profits: A Monte Carlo Analysis for the Netherlands. *The Energy Journal*, *43*(5), 181-204.

Deasy-Millar, A., Fraile, D., Muron, M., Pawelec, G., Santos, S. & Olivia Staudenmayer, O. (2025). *Clean Hydrogen Monitor 2025*. Hydrogen Europe.

International Energy Agency. *Energy and Carbon Tracker 2022*. International Energy Agency. https://www.iea.org/data-and-statistics/data-product/iea-energy-and-carbon-tracker-2022

International Energy Agency. (no date) *Share of renewables in energy consumption in Morocco*. International Energy Agency. https://www.iea.org/countries/morocco/renewables#what-is-the-role-of-renewables-in-electricty-generation-in-morocco

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy justice: A conceptual review. *Energy research & social science*, *11*, 174-182.

Kalt, T., Simon, J., Tunn, J., & Hennig, J. (2023). Between green extractivism and energy justice: competing strategies in South Africa's hydrogen transition in the context of climate crisis. *Review of African Political Economy*, *50*(177-178), 302-321.

Kettani, M., & Sanin, M. E. (2024). Energy consumption and energy poverty in Morocco. *Energy Policy*, *185*, 113948.

Kingdom of Morocco (2025, March 7) *Five National, International Operators to Develop Six Green Hydrogen Projects in Southern Morocco, $31 Million Investment*. Maroc.ma, Ministry of Youth, Culture and Communication. https://www.maroc.ma/en/news/five-national-international-operators-develop-six-green-hydrogen-projects-southern-morocco-31

Kingdom of Morocco (2021)"Feuille de route de l'hydrogène vert: Vecteur de Transition Énergétique et de Croissance Durable,".

Lanckton, T., & DeVar, S. (2021). Justice in 100 metrics. *Initiative for Energy Justice*.

Lindner, R. (2023). Green hydrogen partnerships with the G lobal S outh. Advancing an energy justice perspective on "tomorrow's oil". *Sustainable Development*, *31*(2), 1038-1053.

MacDonald, A. (2025, November 6). *Fifty years of plunder: How Morocco and its allies profit from Western Sahara*. Middle East Eye. https://www.middleeasteye.net/news/western-sahara-fifty-years-plunder-profit-morocco-allies

Martín-Gamboa, M., Mancini, L., Eynard, U., Arrigoni, A., Valente, A., Weidner, E., & Mathieux, F. (2025). Social life cycle hotspot analysis of future hydrogen use in the EU. *The International Journal of Life Cycle Assessment*, *30*(6), 1379-1396.

Masen (n.d.) *Green Hydrogen Morocco Offer*. Moroccan Agency for Sustainable Energy. https://www.masen.ma/en/green-hydrogen-moroccan-offer

McCauley, D. A., Heffron, R. J., Stephan, H., & Jenkins, K. (2013). Advancing energy justice: the triumvirate of tenets. *International Energy Law Review*, *32*(3), 107-110.

Ministerie van Volkshuisvesting en Ruimtelijke Ordening (2025) Het statistisch woningtekort uitgelegd. Ministerie van Volkshuisvesting en Ruimtelijke Ordening. https://www.volkshuisvestingnederland.nl/onderwerpen/aanpak-woningtekort/berekening-woningbouwopgave

Moerenhout, J., van Nuffel, L., de Haas, V. & Jagtenberg, H. (2024) *Onderzoek naar vraagstimulering voor groene waterstof in de Nederlandse industrie: Analyse van vijf mogelijke instrumenten*. Trinomics. https://www.rijksoverheid.nl/documenten/rapporten/2025/07/14/onderzoek-naar-vraagstimulering-waterstofindustrie

Mohideen, M. M., Subramanian, B., Sun, J., Ge, J., Guo, H., Radhamani, A. V., ... & Liu, Y. (2023). Techno-economic analysis of different shades of renewable and non-renewable energy-based hydrogen for fuel cell electric vehicles. *Renewable and Sustainable Energy Reviews*, *174*, 113153.

Moktadir, M. A., & Ren, J. (2025). An Innovative Social Life Cycle Decision-Making Model for Assessing Social Sustainability: A Case of Green Hydrogen Production. *Sustainable Development*.

Müller, F., Tunn, J., & Kalt, T. (2022). Hydrogen justice. *Environmental Research Letters*, *17*(11), 115006.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Mungiu-Pippidi, A. (2022) "Transparency and Corruption: Measuring real transparency by a new index" Regulation and Governance. DOI: 10.1111/rego.1250.

Netbeheer Nederland (2025, October 6). *Stand van Uitvoering: De voortdurende beweging op het gebied van elektriciteit.* Netbeheer Nederland halfjaarpublicatie. https://www.netbeheernederland.nl/publicatie/stand-van-de-uitvoering-halfjaarpublicatie-2025

Nicolay, K., Steinbrenner, D., Woelfing, N., & Spix, J. (2023). The effectiveness and distributional consequences of excess profit taxes or windfall taxes in light of the Commission's recommendation to Member States.

Palomo-Vélez, G., Perlaviciute, G., Contzen, N., & Steg, L. (2025). How company history and hydrogen type shape public trust and acceptability: A reputation management perspective. *Energy Research & Social Science*, *127*, 104279.

Patonia, A. (2025). Green hydrogen and its unspoken challenges for energy justice. *Applied Energy*, *377*, 124674.

Pelliconi, A.M. & Von Massow, S. (2025 October 16). How Not to Trade with Occupying Powers: Western Sahara and the Amendment to the EU-Moroccan Association Agreements. *EJIL:TALK.* https://www.ejiltalk.org/how-not-to-trade-with-occupying-powers-western-sahara-and-the-amendment-to-the-eu-moroccan-association-agreements/

Perey, P., & Mulder, M. (2023). International competitiveness of low-carbon hydrogen supply to the Northwest European market. *International Journal of Hydrogen Energy*, *48*(4), 1241-1254. https://doi.org/10.1016/j.ijhydene.2022.10.011

Perlaviciute, G., & Squintani, L. (2023). Time to talk about values, time to say no: What drives public participation in decision-making on abstract versus concrete energy projects?. *PLOS Climate*, *2*(8), e0000228.

Project, W. J. (2025). WJP Rule of Law Index 2025. https://worldjusticeproject.org/rule-of-law-index/

Reporters Without Borders (2025). *Morocco/ Western Sahara*. Reporters Without Borders. https://rsf.org/en/country/morocco-western-sahara

Regulation 2024/1789. *Regulation (EU) No 2024/1789 of the European Parliament and of the Council of 13 June 2024 on the internal markets for renewable gas, natural gas and hydrogen*. http://data.europa.eu/eli/reg/2024/1789/oj

Reyes, E., 2022. *Morocco and Germany overcome diplomatic crisis and unblock investment in green hydrogen*. Universidad de Navara. Available from: https://en. unav.edu/web/global-affairs/marruecos-y-alemania-superan-la-crisis-diplomatica -y-desencallan-las-inversiones-para-el-hidrogeno-verde

Schlosberg, D. (2004). Reconceiving environmental justice: global movements and political theories. *Environmental politics*, *13*(3), 517-540.

Shenabi, M. (2024, May 30). *Just Energy Transitions? Lessons From Oman and Morocco*. Carnegie Endowment for International Peace. https://carnegieendowment.org/research/2024/05/morocco-oman-energy-transition-oil-exporting-renewable?lang=en

Scott, M., & Powells, G. (2020). Towards a new social science research agenda for hydrogen transitions: Social practices, energy justice, and place attachment. *Energy Research & Social Science*, *61*, 101346.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. *Applied energy*, *142*, 435-444.

Spisto, A., Gerbelova, H., Masera, M. and Barboni, M., The socio-economic impacts of the closure of the Groningen gas field, EUR 30208 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-18607-6, doi:10.2760/039540, JRC120521.

Squintani, L., & Schouten, S. (2024). Public Participation in the Hydrogen Economy: Lessons Learned from the Northern Netherland Hydrogen Valley from Part II-Regulating Hydrogen Markets. In *Cambridge Handbook of Hydrogen and the Law* (pp. 158-170). Cambridge University Press.

ter Berke, S., Ursavas, E., & Zhu, S. Identifying the Technical, Regulatory, and Market Barriers Inhibiting the Commercialization of an Integrated Hydrogen Economy in the Northern Netherland.

Terlouw, T., Rosa, L., Bauer, C., & McKenna, R. (2024). Future hydrogen economies imply environmental trade-offs and a supply-demand mismatch. *Nature communications*, *15*(1), 7043.

The Fund for Peace (2025). *Fragile States Index Global Data.* The Fund for Peace. *https://fragilestatesindex.org/global-data/*

Todts, W. Spence Jackson, H. Müller-Kraenner, S. Vassalo, G. Martinelli, C. Assous, A. (2024, December 16). *More stringent rules for 'blue hydrogen' based on fossil gas in the low-carbon fuels delegated act are needed to ensure a level playing field for Renewable Fuels of Non-Biological Origin*. Environmental Defense Fund. https://www.edfeurope.org/news/2024/16/12/more-stringent-rules-blue-hydrogen-based-fossil-gas-low-carbon-fuels-delegated-act

Toutate, I. (2025, May 3). Dakhla Seawater Desalination Plant Boosts Sustainable Agriculture and Economy. Morocco World News. https://www.moroccoworldnews.com/2025/05/196503/dakhla-seawater-desalination-plant-boosts-sustainable-agriculture-and-economy/

Tweede Kamer. Rapport Parlementaire Enquêtecommissie Aardgaswinning Groningen. 2023. Available online: https://www.tweedekamer.nl/Groningen/rapport (accessed on 15 June 2025).

Treaty on European Union of 13 December 2007 OJ C 202.

United Nations (2024*) Non-Self-Governing Territories.* United Nations https://www.un.org/dppa/decolonization/en/nsgt

United Nations Office of the High Commissioner for Human Rights (2023), *Opinion no 23/2023, concernant Sidi Abdallah Abbahah, MohamedEl Bachir Boutangiza, Mohamed Bani, Abdel Jalil Laaroussi,Abdulahi Lakhfaouni, Ahmed Sbai, Sid'Ahmed Lemjaid, BrahimIsmaili, Mohammed Khouna Babait, Mohamed Embareh Lefkir,Ennaâma Asfari, Mohamed Bouryal, Mohamed Lamin Haddi,El Hasane Azaoui, Abdellah Toubali, El Bachir Khadda, El HassanEddah and Mohamed Tahlil (Morocco).* Opinions adopted by the Working Group on Arbitrary Detention at its 96th session. Opinion 23/2023 (Morocco) A/HRC/WGAD/2023/23.

Van Der Zwaan, B., Lamboo, S., and Dalla Longa, F., 2021. Timmermans' dream: an electricity and hydrogen partnership between Europe and North Africa. *Energy Policy*, 159, 112613. doi:10.1016/j.enpol.2021.112613

Veenstra, A. T., & Mulder, M. (2024). Profitability of hydrogen production: Assessment of investments in electrolysers under various market circumstances. *Applied Energy*, *375*, 124111.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Walker, G. (2009). Beyond distribution and proximity: exploring the multiple spatialities of environmental justice. *Antipode*, *41*(4), 614-636.

Wehrey, F. & Bonney, A. (2025, March 6). *Beyond the Green Transition: Governance and Climate Vulnerability in Morocco*. Carnegie Endowment for International Peace.

https://carnegieendowment.org/research/2025/03/beyond-the-green-transition-governance-and-climate-vulnerability-in-morocco?lang=en

Werker, J., Wulf, C., & Zapp, P. (2019). Working conditions in hydrogen production: A social life cycle assessment. *Journal of industrial ecology*, *23*(5), 1052-1061.

Western Sahara Resource Watch. (2017, April 26). *Unemployed Saharawis set up protest camp in occupied Western Sahara*. Western Sahara Resource Watch. https://wsrw.org/en/archive/3831

Western Sahara Resource Watch. (2023, November 3) *Moroccan government reveals energy gigaplans in occupied territory*. Western Sahara Resource Watch. https://wsrw.org/en/news/moroccan-gov-reveals-energy-gigaplans-in-ot

Western Sahara Resource Watch. (2025a, August 11). *Morocco pushes enormous green hydrogen plans in occupied Western Sahara.* Western Sahara Resource Watch. https://wsrw.org/en/news/morocco-pushes-enormous-green-hydrogen-plans-in-occupied-western-sahara

Western Sahara Resource Watch. (2025b, September 18). *Morocco's thirst for water quenched by Western Sahara winds.* Western Sahara Resource Watch. https://wsrw.org/en/news/moroccos-thirst-for-water-quenched-by-western-sahara-winds

World Bank (2023, May 22). *Morocco CCDR – Morocco - Country Climate and Development Report (CCDR) : Background Paper - Water Scarcity and Droughts*. World Bank Group (Report: 182262/1). http://documents.worldbank.org/curated/en/099052223171017467

Yahyaoui, A., Wang, I., Sammoud, K. & Nyberg, M. (2024) *Morocco's Just Energy Transition 2024*. Liberal International.

Zamagni, A., Mancini, L., Eynard, U., Arrigoni, A., & Mathieux, F. (2025). *A conceptual framework for assessing and monitoring social risks and impacts related to hydrogen technologies and their value chains*. Publications Office of the European Union (JRC138850).

Case study 12

Al Jazeera. (2023, June 9). Serbians join anti-government protest following mass shootings. Al Jazeera. https://www.aljazeera.com/news/2023/6/9/serbians-join-anti-government-protest-following-mass-shootings

Arhiv javnih skupova. (2024, August 16). Konačna procena protesta protiv Rio Tinta u Beogradu. Javni skupovi. https://javniskupovi.org/index.php/2024/08/16/korekcija-procene-protesta-protiv-rio-tinta-u-beogradu/

Autonomija. (2021, October 21). Žofre: Potrebno jačanje nezavisnosti sudstva kroz ustavne reforme. Autonomija https://autonomija.info/zofre-potrebno-jacanje-nezavisnosti-sudstva-kroz-ustavne-reforme/

B92. (2021, June 1). Rio Tinto: Jedno od najvećih nalazišta u svetu, biće investirano 450 miliona dolara. B92. https://www.b92.net/biz/vesti/srbija/rio-tinto-jedno-od-najvecih-nalazista-u-svetu-bice-investirano-450-miliona-dolara-foto-1867325?version=amp

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Balkan Green Energy News. (2024, September 20). Jadar project timeline: A full overview of the most controversial investment in Serbia's recent history. Balkan Green Energy News. https://balkangreenenergynews.com/jadar-project-timeline-a-full-overview-of-the-most-controversial-investment-in-serbias-recent-history/

Balkan Green Energy News. (2024, June 13). Rio Tinto releases draft environmental impact assessments for Jadar Project. Balkan Green Energy News. https://balkangreenenergynews.com/rio-tinto-releases-draft-environmental-impact-assessments-for-jadar-project/

Balkan Insight. (2022, April 13). It's [not] over: The past, and present, of lithium mining in Serbia. Balkan Insight. https://balkaninsight.com/2022/04/13/its-not-over-the-past-and-present-of-lithium-mining-in-serbia/

Balkan Insight. (2024, October 10). Serbian MPs reject proposed ban on lithium and boron mining. Balkan Insight. https://balkaninsight.com/2024/10/10/serbian-mps-reject-proposed-ban-on-lithium-and-boron-mining/

Balkan Insight. (2024, July 11). Serbian court ruling on scrapped lithium mine dismays environmentalists. Balkan Insight. https://balkaninsight.com/2024/07/11/serbian-court-ruling-on-scrapped-lithium-mine-dismays-environmentalists/

Balkan Insight. (2024, April 3). Belgrade faces June repeat poll as party deal on elections fails. Balkan Insight. https://balkaninsight.com/2024/04/03/belgrade-faces-june-repeat-poll-as-party-deal-on-elections-fails/

Balkan Insight. (2024, April 26). Serbia opposition's collapse will cost it dearly in elections. Balkan Insight. https://balkaninsight.com/2024/04/26/serbia-oppositions-collapse-will-cost-it-dearly-in-elections/

Bebbington, A. (2008). Mining and social movements: Struggles over livelihood and rural territorial development in the Andes. *World Development*, *36*(12), 2888–2905. https://doi.org/10.1016/j.worlddev.2007.11.016

Danas. (2023, October 3). Brnabić: Litijum najveća razvojna šansa za Srbiju, ne vidim kako može da oživi projekat Jadar.Danas. https://www.danas.rs/vesti/ekonomija/brnabic-litijum-najveca-razvojna-sansa-za-srbiju-ne-vidim-kako-moze-da-ozivi-projekat-jadar/

Danas. (2023, November 3). Vučić: Ne menja se prostorni plan u Loznici kako bi se upisao projekat Rio Tinta. Danas. https://www.danas.rs/vesti/politika/vucic-ne-menja-se-prostorni-planu-loznici-kako-bi-se-upisao-projekat-rio-tinta/

Danas. (2023, December 30). Đilas odgovorio na prozivku iz Kreni-promeni: Uvek govorim isto. Danas. https://www.danas.rs/vesti/politika/djilas-odgovorio-na-prozivku-iz-kreni-promeni-uvek-govorim-isto/

Danas. (2024, January 19). Radomir Lazović: Narodna inicijativa o zabrani rudarenja litijuma nije u skupštinskoj proceduri. Danas. https://www.danas.rs/vesti/politika/radomir-lazovic-narodna-inicijativa-o-zabrani-rudarenja-litijuma-nije-u-skupstinskoj-proceduri/

Danas. (2024, august 11). Vučić rekao da narednih dana očekuje otvaranje mosta na Ibru. Danas. https://www.danas.rs/vesti/politika/vucic-otvaranje-mosta-na-ibru/

DW. (2024, 11. august). Beograd: Veliki protest protiv iskopavanja litijuma. DW https://www.dw.com/sr/beograd-veliki-protest-protiv-iskopavanja-litijuma/a-69910065

Djukanovic, N. (2025). GreenPaths Webinar: "How the lithium rush is producing sacrifice zones in Europe and beyond". GreenPaths YouTube channel: https://youtu.be/i-BTgVv3Xo4?si=_vCjXx_sYqkVKvLj

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Đorđević, D., Tadić, J. M., Grgur, B., Ristić, R., Sakan, S., Brezjanović, J., Stevanović, V., & Šolaja, B. (2024). The influence of exploration activities of a potential lithium mine to the environment in Western Serbia. *Scientific Reports, 14*, Article 17090. https://doi.org/10.1038/s41598-024-68072-9

Đukanović, N. (2022). "Green are fields, not mines": the case of lithium mining and resistance in Serbia**,** [Master's thesis, University of Oxford]. Oxford Research Archive. https://ora.ox.ac.uk/objects/uuid:8f16aea7-62f7-4ff1-8b25-8a9c3ed31f7c

EBA250. (2021, May 26). Rio Tinto partners with InoBat to explore innovative lithium battery initiative. EBA250. https://www.eba250.com/rio-tinto-partners-with-inobat-to-explore-innovative-lithium-battery-initiative/

Energetski portal. (2020, 21. juli). Pobeda meštana Stare planine – na Staroj se neće graditi male hidroelektrane. https://energetskiportal.rs/pobeda-mestana-stare-planine-na-staroj-se-nece-graditi-mhe/

Ergo Strategy Group. (2023). Jadar project economic impact assessment. https://ergostrategygroup.com/wp-content/uploads/2023/09/Ergo-Strategy-Group-Jadar-Economic-Impact-Assessment-Sep23-SR-spread.pdf

Euronews. (2023, April 20). On elections, effects of the meeting with Vučić, and the plans for Kosovo; Djilas directly with Minja Miletić [Video]. YouTube. https://www.youtube.com/watch?v=Jd8J5zDNV2Q

European Commission. (2025, June 4). Selected strategic projects under the CRMA. Single Market Economy. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/strategic-projects-under-crma/selected-projects_en

European Commission. (2023). Critical Raw Materials Act. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en

European Commission. (2024a). Proposal for a Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023PC0160

European Commission & Government of the Republic of Serbia. (2023). Memorandum of Understanding between the European Union and the Republic of Serbia on a strategic partnership on sustainable raw materials, battery value chains and electric vehicles. https://single-market-economy.ec.europa.eu/document/download/6fe0e605-9299-45c3-b846-2efb85585251_en

European Commission. (2025, May 6). Speech by Commissioner Kos at the European Parliament — reports on Serbia. European Commission. https://ec.europa.eu/commission/presscorner/api/files/document/print/en/speech_25_1158/SPEECH_25_1158_EN.pdf

European Parliament. (2024, February 8). Serbia did not fulfil its commitments to free and fair elections, say MEPs. European Parliament. https://www.europarl.europa.eu/news/en/press-room/20240202IPR17327/serbia-did-not-fulfil-its-commitments-to-free-and-fair-elections-say-meps

European Parliament & Council of the European Union. (2023, 12 July). Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC. Official Journal of the European Union, L 191. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1542

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

European Parliament. (2024, February 8). Serbia did not fulfil its commitments to free and fair elections, say MEPs. European Parliament. https://www.europarl.europa.eu/news/en/press-room/20240202IPR17327/serbia-did-not-fulfil-its-commitments-to-free-and-fair-elections-say-meps

European Parliament & Council. (2023). Regulation (EU) 2023/1542 on batteries and waste batteries. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023R1542

European Greens. (2024, September 26). European Greens stand in solidarity with people in Serbia opposing the Rio Tinto Jadar mining project. European Greens. https://europeangreens.eu/news/european-greens-stand-in-solidarity-with-people-in-serbia-opposing-the-rio-tinto/

Eurostat. (2022). Gini coefficient of equivalised disposable income (code: tessi190) [Data set]. European Commission. Retrieved [27.10.2025], from https://ec.europa.eu/eurostat/databrowser/view/tessi190/default/table?lang=en

Eurostat. (2023). Share of renewable energy in gross final energy consumption [Data set]. European Commission. Retrieved [27.10.2025], from https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_ren__custom_16278291/default/table?lang=en

EU Transparency Register. (2024). Entry for Rio Tinto Minerals Development Limited. https://ec.europa.eu/transparencyregister/public/consultation/displaylobbyist.do?id=68237907933-05

Filipović, V., Bulatović, A., & Gligorić, R. (2022). Mound 28 from the Paulje necropolis in Brezjak – A contribution to the absolute chronology of the Late Bronze Age in Serbia. Starinar, 72, 73–90. https://doiserbia.nb.rs/img/doi/0350-0241/2022/0350-02412272073F.pdf

Government of Serbia. (2020, November 19). Jadar strategically important project for Serbia. Government of Serbia. https://www.srbija.gov.rs/vest/en/163687/jadar-strategically-important-project-for-serbia.php

Government of Serbia (2021, December 14) Serbia opens cluster 4 in accession negotiations with EU. Government of Serbia https://www.srbija.gov.rs/vest/en/182521/serbia-opens-cluster-4-in-accession-negotiations-with-eu.php/

Government of Serbia. (2024, August 28). Scientific community invited to participate in discussion on Jadar project. Government of Serbia. https://www.srbija.gov.rs/vest/en/229291/scientific-community-invited-to-participate-in-discussion-on-jadar-project.php

Government of Serbia. (2024). Serbia, EU sign Memorandum of Understanding on Mineral Raw Materials. Government of Serbia. https://www.srbija.gov.rs/vest/en/227398/serbia-eu-sign-memorandum-of-understanding-on-mineral-raw-materials.php

Gautneb, H., et al. (2019). Lithium-bearing mineral deposits in Serbia – geological overview and economic potential. In: Jovanović, D. (Ed.), *Mineral Resources of Serbia*. Geological Survey of Serbia.

Insajder TV. (2023, June 24). “Insajder Interview: Dubravka Djedović.” Insajder TV. https://www.youtube.com/watch?v=lyGclwjdTD0&ab_channel=InsajderVideo

Insajder Video. (2024, October 9). Insajder intervju: Dubravka Djedović [Video]. YouTube. https://www.youtube.com/watch?v=zRG0uMvwm74

Ivanji, A. (2024, July 24). Solz–Vučić lithium alliance. Vreme. https://vreme.com/en/vreme/litijumski-savez-solc-vucic/

This project has received funding from the European Union’s Horizon Europe research and innovation programme under the grant agreement No 101112305.

Ivanović, L., Tomićević-Dubljević, J., Bjedov, I., Đorđević, J., & Živojinović, I. (2023). Local communities' perceptions under Jadar mineral exploration project: Social license to operate perspective. The Extractive Industries and Society, 15, 101348. https://doi.org/10.1016/j.exis.2023.101348

Ivković, A. (2024, July 29). EU's endorsement of lithium mining will further tarnish its reputation in Serbia. European Western Balkans. https://europeanwesternbalkans.com/2024/07/29/eus-endorsement-of-lithium-mining-will-further-tarnish-its-reputation-in-serbia/

Jelovac, J. (2021, June 4). Vučić: Srbija će od Rio Tinta imati koristi u budućnosti. Nova.rs. https://nova.rs/vesti/politika/vucic-srbija-ce-od-rio-tinta-imati-koristi-u-buducnosti/

Jerez, B., Garcés, I., & Torres, R. (2021). Lithium extractivism and water injustices in the Salar de Atacama, Chile: The colonial shadow of green electromobility. *Political Geography, 87*, 102382. https://doi.org/10.1016/j.polgeo.2021.102382

KoSSev. (2021, December 16). Protest u Loznici protiv rudnika litijuma: Uvek će neko stati i reći – nećete kopati. KoSSev https://kossev.info/en/protest-u-loznici-protiv-rudnika-litijuma-uvek-ce-neko-stati-i-reci-necete-kopati/

Kreni-Promeni. (n.d.). STOP rudniku litijuma! Rio Tinto – „Marš sa Drine*!"* [Online petition]. Peticije.kreni-promeni.org. https://peticije.kreni-promeni.org/petitions/stop-rudniku-litijuma-rio-tinto-mars-sa-drine

Krizmanić, I., Živić, I., Niketić, M., Vukov, T., Đirović, D., Kuzmanović, N., Vesović, N., Anđelković, M., Đinović, G., Nikolić, D., Penezić, A., Mančić, M., Bogdanović, N., Popović, M., & Lakušić, D. (2024). Projekat Jadar: Biodiverzitet i biološki uticaji. V. Stevanović, B. Šolaja, & V. Radmilović (Eds.), Projekat Jadar – Šta je poznato? (pp 157–175). Srpska akademija nauka i umetnosti.

Latković, N. (2023, 14. avgust). Otkrivamo: Ogromna imovina Rio Tinta u dolini Jadra — Vučić predlagao rušenje kuća, evo koliko objekata i zemljišta je kupljeno zbog litijuma. Nova.rs. https://nova.rs/vesti/politika/otkrivamo-ogromna-imovina-rio-tinta-u-dolini-jadra-vucic-predlagao-rusenje-kuca-evo-koliko-objekata-i-zemljista-je-kupljeno-zbog-litijuma/

Marca Lazo, C. M. (2022). Geographies of lithium in Bolivia*:* Conflicts over conditions (Thesis, University of Oklahoma). ShareOK. https://shareok.org/items/71877555-ab95-4a10-b073-ca1c2acc58cb

Marš sa Drine. (2025, 11. maj). Projekat Jadar – od početka do danas. https://marssadrine.org/informacija-o-projektu-jadar/

Ministarstvo građevinarstva, saobraćaja i infrastrukture. (2020). Nacrt Prostornog plana područja posebne namene za projekat Jadar. https://www.mgsi.gov.rs/sites/default/files/NACRT%20PPPPN%20JADAR%20JU.pdf

Ministry of Mining and Energy. (2023). Annual Report on Energy Transition and Use of EVs in Serbia. Government of the Republic of Serbia.

N1. (2021, December 2). 360 degrees of Dragan Đilas [Video]. YouTube. https://www.youtube.com/watch?v=ublc6gvDKrk

N1 Beograd. (2024, July 19). Šefčovič: Vidimo vas, želimo vas u EU i projekat Jadar samo će ubrzati taj proces. N1 info https://n1info.rs/vesti/sefcovic-vidimo-vas-zelimo-vas-u-eu-i-projekat-jadar-samo-ce-ubrzati-taj-proces/

N1 Belgrade. (2024, June 24). Vucic: Lithium mine requires guarantees. N1. https://n1info.rs/english/news/vucic-lithium-mine-requires-guarantees/

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

N1 Belgrade. (2024, July 9). Vucic blames foreign agencies for stopping lithium mining. N1. https://n1info.rs/english/news/vucic-blames-foreign-agencies-for-stopping-lithium-mining/

N1 Belgrade. (2024, February 9). Serbian opposition warns Europe of 'dictatorship'. N1. https://n1info.rs/english/news/politico-serbian-opposition-warns-europe-of-dictatorship/

Narodna skupština Republike Srbije. (1995). Zakon o rudarstvu. Službeni glasnik RS, 44/95.

Narodna skupština Republike Srbije. (2006). Zakon o rudarstvu. Službeni glasnik RS, 34/06.

Narodna skupština Republike Srbije. (2011). Zakon o rudarstvu i geološkim istraživanjima. Službeni glasnik RS, 88/2011.

Narodna skupština Republike Srbije. (2015). Zakon o rudarstvu i geološkim istraživanjima („Službeni glasnik RS", br. 101/2015).

Novaković, B. (2022, August 18). Is EU to sacrifice Balkans to secure resources for its energy transition? Balkan Green Energy News. https://balkangreenenergynews.com/is-eu-to-sacrifice-balkans-to-secure-resources-for-its-energy-transition/

Nova.rs. (2021, October 6). Otkud Rio Tinto u razgovorima Palmera sa srpskom opozicijom? Nova.rs. https://nova.rs/vesti/politika/otkud-rio-tinto-u-razgovorima-palmera-sa-srpskom-opozicijom/

Novosti. (2021, December 13). Dobrica Veselinović: Rio Tinto je poraz Vučića. Novosti. https://www.portalnovosti.com/dobrica-veselinovic-rio-tinto-je-poraz-vucica

Office of the President of the Republic of Serbia. (2021, June 1). Meeting with the Rio Tinto delegation [Press release]. Retrieved from https://www.predsednik.rs/en/press-center/press-releases/meeting-with-the-rio-tinto-delegation

Paul, S., Tan, F., & Menon, P. (2022, January 20). Serbian government revokes Rio Tinto's licences for lithium project. Mining.com. https://www.mining.com/web/serbian-government-revokes-rio-tintos-licences-for-lithium-project/

Perišić, J. (2025, April 1). Širok front u javnosti protiv proglašenja projekta Jadar strateškim projektom EU. Balkan Green Energy News. https://balkangreenenergynews.com/rs/sirok-front-u-javnosti-protiv-proglasenja-projekta-jadar-strateskim-projektom-eu/

Politika. (2024, June 22). Ana Brnabić: Litijum velika šansa za razvoj Srbije, to je „nafta 21. veka". Politika Online. Retrieved from https://www.politika.rs/sr/clanak/619888/ana-brnabic-litijum-velika-sansa-za-razvoj-srbije-to-je-nafta-21-veka

Politika. (2023, avgust 4). Državu niko ne sme da ucenjuje.Politika. https://www.politika.rs/sr/clanak/549247/Drzavu-niko-ne-sme-da-ucenjuje

Politika. (2024, oktobar 16). Dve strane službe zaustavile iskopavanje litijuma u Srbiji. Politika. https://www.politika.rs/sr/clanak/559545/Dve-strane-sluzbe-zaustavile-iskopavanje-litijuma-u-Srbiji

Politika. (2024, August 2). "Vučić: Nepoverenje građana u Rio Tinto najveći problem, dobro je što je direktor došao da čuje njihovo mišljenje." Politika. https://www.politika.rs/sr/clanak/631221/vucic-nepoverenje-gradana-u-rio-tinto-najveci-problem-dobro-je-da-je-direktor-dosao

Radio Free Europe. (2021, November 29). Vučić o Rio Tintu: Ako bude još pritisaka, povući ćemo se. Radio Slobodna Evropa. https://www.slobodnaevropa.org/a/vucic-rio-tinto/31589250.html

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Radiotelevizija Vojvodine. (2021, decembar 12). Dačić: Ispunjeni zahtevi ekoloških pokreta, nema razloga za proteste. RTV. https://rtv.rs/sr_lat/politika/dacic-ispunjeni-zahtevi-ekoloskih-pokreta-nema-razloga-za-proteste_1307436.html

Radiotelevizija Vojvodine. (2022, January 20). Brnabić: Poništeni su svi akti o Rio Tintu, stavljena tačka na ceo slučaj. RTV. https://rtv.rs/sr_lat/politika/brnabic-ponisteni-svi-akti-o-rio-tintu-stavljena-tacka-na-ceo-slucaj_1307051.html

Rajković, I. (2022, April 19). The people against Rio Tinto: Three ecopopulist lessons for the Balkan Left. Lefteast. https://lefteast.org/people-against-rio-tinto-three-ecopopulist-lessons/

Ralev, R. (2022, January 11). Serbia attracts 3.9 bln euro of FDI in 2021 – PM. SeeNews. https://seenews.com/news/serbia-attracts-3-9-bln-euro-of-fdi-in-2021-pm-1202532

Republički zavod za statistiku. (2014). Profil opštine Loznica. http://devinfo.stat.gov.rs/serbiaprofilelauncher/files/profiles/sr/1/DI_Profil_Loznica_EURSRB002001003006.pdf

Reuters. (2024, July 11). Serbian court rules govt decision to revoke lithium project permit unconstitutional. Retrieved October 11, 2025, from

Reuters. (2022, January 27). Serbia's green activists rally to demand moratorium on lithium mining. Reuters. https://www.reuters.com/world/europe/serbias-green-activists-rally-demand-moratorium-lithium-mining-2022-01-27/

Reuters (2024, July 19) Serbia, EU and Germany sign battery supply chain deal. Reuters https://www.reuters.com/sustainability/serbia-eu-germany-sign-battery-supply-chain-deal-2024-07-19/

Reuters. (2024, July 11). Rio Tinto welcomes Serbian court ruling on lithium project. Reuters. https://www.reuters.com/markets/commodities/serbian-court-rules-govt-decision-revoke-lithium-project-permit-unconstitutional-2024-07-11/

RFE/RL. (2024, August 20). EU rejects accusation that West played role in recent anti-mining protests in Serbia. Radio Free Europe/Radio Liberty. https://www.rferl.org/a/serbia-lithium-mining-protests-european-union/33086180.html

Rio Tinto Serbia. (n.d.). Ekonomski razvoj lokalne zajednice. Retrieved [24. October 2025], from https://riotintoserbia.com/lokalne-zajednice/Ekonomski-razvoj-lokalne-zajednice/

Rio Tinto Sava Exploration. (n.d.). Najčešća pitanja i odgovori o projektu „Jadar“. Retrieved [16. Novembre 2025], from https://riotintoserbia.com/komunikacije/pitanja-i-odgovori/

Ristić, R., Malušević, I., Nešković, P., Nešković, P., Novaković, A., Polovina, S., Milčanović, V. (2024), Degradacija prostora u okviru projekta “Jadar”. V. Stevanović, B. Šolaja, & V. Radmilović (Eds.), Projekat Jadar – Šta je poznato? (pp 157–175). Srpska akademija nauka i umetnosti.

Roche, L., Link, A., Marinova, S., Coroama, V., & Finkbeiner, M. (2024). S-LCA of lithium mining in Chile and its potential impacts on water and the local community. *The International Journal of Life Cycle Assessment, 30*, 1201-1228. https://doi.org/10.1007/s11367-024-02378-8

Serbia Elects. (2024, April 23). New opposition coalition “I Choose to Fight!” formed by the “Serbia Against Violence” members who will run in Belgrade. Serbia Elects.

Spasić, V. (2024, August 13). Question isn't whether lithium in Serbia will be mined or not, but who will do it – Brantner. Balkan Green Energy News. https://balkangreenenergynews.com/question-isnt-whether-lithium-in-serbia-will-be-mined-or-not-but-who-will-do-it-brantner/

This project has received funding from the European Union’s Horizon Europe research and innovation programme under the grant agreement No 101112305.

Stevanović, V., Šolaja, B., & Radmilović, V. (Eds.). (2024). Projekat Jadar – Šta je poznato? Beograd: Srpska akademija nauka i umetnosti

Stručnjaci GOVORE. (2024, Jun). Litijum: Stručnjaci govore | GOST Dejan Šoškić [Video]. YouTube. https://www.youtube.com/watch?v=Q6U0ctmCRsY

Šoškić, M., Popović, D., Mijatović, B., & Drakulić, M. (2024). Koliko bi Srbija dobila od projekta Jadar? Beograd: Balkan Green Energy News. https://balkangreenenergynews.com/wp-content/uploads/2024/10/Koliko-bi-Srbija-dobila-od-projekta-Jadar-Soskic-Popovic-Mijatovic-Drakulic-2024-10-06-151453.pdf

Šterić, L. (2023, October). Battery of green transition or colonial wasteland: Political discourse on the "Jadar" project. Belgrade Centre for Security Policy. https://bezbednost.org/wp-content/uploads/2023/10/Green-Transition-srb-fin.pdf

Tatalović, Ž. (2024, June 24). (VIDEO) Šta je Brnabić govorila 2022. i da li je Rio Tinto dobio zeleno svetlo: Vučić na pitanja N1 o litijumu. N1. https://n1info.rs/vesti/video-sta-je-brnabic-govorila-2022-i-da-li-je-rio-tinto-dobio-zeleno-svetlo-vucic-na-pitanja-n1-o-litijumu/

Todorović, I. (2025, June 6). EU's strategic status for Rio Tinto's lithium project risks fueling tensions in Serbia. Balkan Green Energy News. https://balkangreenenergynews.com/eus-strategic-status-for-rio-tintos-lithium-project-risks-fueling-tensions-in-serbia/

Todorović, I. (2024, October 11). Parliament of Serbia rejects lithium mining ban proposal. Balkan Green Energy News. https://balkangreenenergynews.com/parliament-of-serbia-rejects-lithium-mining-ban-proposal/

Todorović, I. (2024, July 11). Protest outside Constitutional Court of Serbia against Rio Tinto's lithium project Jadar. Balkan Green Energy News. https://balkangreenenergynews.com/protest-outside-constitutional-court-of-serbia-against-rio-tintos-lithium-project-jadar/

Todorović, I. (2024, February 22). Serbia's Đedović: We have billions under our feet in strategic minerals. Balkan Green Energy News. https://balkangreenenergynews.com/serbias-dedovic-we-have-billions-under-our-feet-in-strategic-minerals/

United Nations Framework Convention on Climate Change. (n.d.). *Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts*. https://unfccc.int/topics/adaptation-and-resilience/workstreams/loss-and-damage/warsaw-international-mechanism

Vasović, M. (2021, December 23). Vucic's new pose as Serbia's 'protector' shouldn't fool anyone. Balkan Insight. https://balkaninsight.com/2021/12/23/vucics-new-pose-as-serbias-protector-shouldnt-fool-anyone/

Vreme. (2024, August 1). European Commission: Control of environmental standards of the "Jadar" project is the responsibility of the Serbian authorities. *Vreme.* https://vreme.com/en/vesti/evropska-komisija-kontrola-ekoloskih-standarda-projekta-jadar-je-odgovornost-srpskih-vlasti/

Vreme. (2021, December 14). Lithium or tradition: Conflict over the mine in the Jadar valley. Deutsche Welle / Vreme. https://vreme.com/en/vesti/litijum-ili-tradicija-sukob-oko-rudnika-u-dolini-jadra/

Velicu, I., & Kaika, M. (2017). Undoing environmental justice: Re-imagining equality in the Rosia Montana anti-mining movement. Geoforum, 84, 305-315.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Vučić: Poštovane su epidemiološke mere na skupštini SNS, svi su dobili maske. Kurir.rs. https://www.kurir.rs/vesti/politika/3818853/vucic-postovane-su-epidemioloske-mere-na-skupstini-sns-svi-su-dobili-maske

Vujasin, M. (2022, August 1). Seven-day deadline for Serbia's new MPs to verify petition against lithium. *Balkan Green Energy News*. https://balkangreenenergynews.com/seven-day-deadline-for-serbias-new-mps-to-verify-petition-against-lithium/

Živanović, M. (2021, September 13). Merkel u Beogradu: Geostrateški interes EU prijem država Zapadnog Balkana. Slobodna Evropa. https://europeanwesternbalkans.com/2025/06/05/european-commission-approves-controversial-serbian-lithium-project-as-strategic-for-the-eu/

Case study 13

Bensús Talavera, V. Lessons on urban planning post-growth. Nat Cities 1, 14–15 (2024). https://doi.org/10.1038/s44284-023-00006-4, accessed 8th September 2025

Corbisiero F, Monaco S (2021), "Post-pandemic tourism resilience: changes in Italians' travel behavior and the possible responses of tourist cities". *Worldwide Hospitality and Tourism Themes*, Vol. 13 No. 3 pp. 401–417, doi: https://doi.org/10.1108/WHATT-01-2021-0011, accessed 10th October 2025

Daly, H. E. (2014). *From uneconomic growth to a steady-state economy*. Advances in Ecological Economics. Edward Elgar Publishing, accessed 25th October 2025

Dodds, Rachel & Butler, Richard. (2019). The phenomena of overtourism: a review. International Journal of Tourism Cities. ahead-of-print. 10.1108/IJTC-06-2019-0090 https://www.scribd.com/document/840848834/Dodds-and-Butler-2019-The-Phenomena-of-Overtourism-A-review, accessed 10th October 2025

Epler Wood, M., Milstein, M., Ahamed-Broadhurst, K., 2019. Destinations at Risk: The Invisible Burden of Tourism. The Travel Foundation https://www.thetravelfoundation.org.uk/invisible-burden/, accessed 18th October 2025

Fletcher, R., Murray Mas, I., Blanco-Romero, A., & Blázquez-Salom, M. (2019). Tourism and degrowth: an emerging agenda for research and praxis. Journal of Sustainable Tourism, 27(12), 1745–1763. https://doi.org/10.1080/09669582.2019.1679822, accessed 29th September 2025

Gössling, Stefan & Hall, Colin & Ekström, Frida & Engeset, Agnes & Aall, Carlo. (2012). Transition management: A tool for implementing sustainable tourism scenarios?. Journal of Sustainable Tourism. 20. 899-916. 10.1080/09669582.2012.699062., accessed 6th September 2025

Higgins-Desbiolles, F., Carnicelli, S., Krolikowski, C., Wijesinghe, G., & Boluk, K. (2019). Degrowing tourism: rethinking tourism. Journal of Sustainable Tourism, 27(12), 1926-1944. https://doi.org/10.1080/09669582.2019.1601732, accessed 6th September 2025

Hirvilammi, T., Peltomaa, J., Pihlajamaa, M., & Tiilikainen, S. (2023). Towards an eco-welfare state: Enabling factors for transformative eco-social initiatives. European Journal of Social Security, 25(4), 445-463. https://doi.org/10.1177/13882627231195724 (Original work published 2023), accessed, 10th October 2025

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Jager, Nicolas & Cotta, Benedetta. (2025). Public participation in eco-social policies: exploring mechanisms for bridging the gap. Doi: 10.56687/9781447372851-013 , accessed 4th November 2025

Koch M, Fritz M. Building the Eco-social State: Do Welfare Regimes Matter? Journal of Social Policy. 2014;43(4):679-703. doi:10.1017/S004727941400035X accessed 28th July 2025

Murray, I., Fletcher, R., Blázquez-Salom, M., Blanco-Romero, A., Cañada, E., & Sekulova, F. (2023). Tourism and degrowth. Tourism Geographies, 1–11. https://doi.org/10.1080/14616688.2023.2293956, accessed 20th October

Pappalepore I., Inkson, C., Dolezal, C. (2025) Tourism Degrowth and Post-Growth Transitions for European Urban Destinations, Responsible Consumption and Production in the Creative and Cultural Industries, https://www.taylorfrancis.com/chapters/edit/10.4324/9781032665740-10/tourism-degrowth-post-growth-transitions-european-urban-destinations-ilaria-pappalepore-clare-inkson-claudia-dolezal, accessed 5th November 2025

Roessler M., Unlocking green transitions: system-level agency in peripheral regions, Cambridge Journal of Regions, Economy and Society, 2025, https://doi.org/10.1093/cjres/rsaf044, accessed 26th November 2025

Savini, F., Ferreira, A., & von Schönfeld, K. (Eds.). (2022). Post-Growth Planning: Cities Beyond the Market Economy (1st ed.). Routledge. https://doi.org/10.4324/9781003160984, accessed 18th November 2025

Seraphin, Hugues & Gladkikh, Tatiana & Thanh, Tan. (2020). Overtourism Causes, Implications and Solutions. https://link.springer.com/book/10.1007/978-3-030-42458-9 accessed 2nd December 2025

World Economic Forum (2022) Travel and tourism development index 2021: rebuilding for a sustainable and resilient future. Insight Report. https://www.weforum.org/publications/travel-and-tourism-development-index-2021/ accessed 18th November 2025

Suau-Sanchez P., Dobruszkes, F., Mattioli G., Does cutting airport slots reduce climate impact? The case of Amsterdam airport, Transportation Research Part D: Transport and Environment,

Volume 143, 2025, https://doi.org/10.1016/j.trd.2025.104744 accessed 2nd December 2025

Varvarousis, Angelos & Kallis, Giorgos & Kaika, Maria. (2025). Transitioning to Post-Growth Cities. Journal of City Climate Policy and Economy. 4. 10.3138/jccpe-2025-0006. accessed, 5th of December 2025.

MEDIA

- https://business.zadar.travel/aktualnosti/zadar-biljezi-najveci-dosadasnji-porast-turistickih-dolazaka-i-nocenja-u-2024, accessed 2nd May 2025
- https://dubrovackidnevnik.net.hr/vijesti/grad/broj-stanovnika-unutar-zidina-nastavlja-padati-ako-postanemo-samo-hotel-za-nekolicinu-bogatih-to-ce-biti-propast, accessed 5th May 2025
- https://www.index.hr/vijesti/clanak/novi-gup-stupio-na-snagu-u-zagrebu-vise-zelenila-i-manje-betona/2711843.aspx, accessed 3rd December 2025
- https://www.slowliving.hr/postoje-li-u-hrvatskoj-i-zeleni-hoteli/, accessed 5th December 2025

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

- https://www.tportal.hr/kultura/clanak/pavicic-stvorena-je-slika-neke-stare-dalmacije-koja-pruza-iluziju-kontinuiteta-pa-se-cak-i-vojne-formacije-ako-treba-macuju-za-turiste-20190906, accessed 5th May 2025
- https://www.tportal.hr/komentatori/clanak/najskuplji-na-mediteranu-turisticka-pohlepa-brzo-bi-nam-se-mogla-obiti-o-glavu-foto-20241210, accessed 5th May 2025
- https://dnevnik.hr/vijesti/hrvatska/sdp-bacicev-zakon-o-gradnji-legalizira-pljacku-i-otima-imovinu-gradanima---951947.html, accessed 16th December 2025
- https://www.tportal.hr/biznis/clanak/juznoj-europi-je-turista-preko-glave-evo-kako-se-konkurencija-hrvatskoj-bori-protiv-najezde-20240828, accessed 2nd December 2025
- https://www.vecernji.hr/vijesti/o-poskupljenjima-na-nasoj-obali-vjerojatno-nitko-nije-vise-pisao-i-govorio-od-nas-samih-1703512 , accessed 5th May 2025
- https://zadarskilist.novilist.hr/zadar-zupanija/zadar/turizam-i-urbanizam-jaka-turistifikacija-grad-u-cijelosti-jos-nije-progutala/ , accessed 5th May 2025

OFFICIAL WEB-SITES

- https://crosto.hr/hr/podrucja-mjerenja/okolisni-pokazatelji/, accessed 20th November 2025
- https://crosto.hr/hr/novosti/objavljene-vrijednosti-indeksa-turisti%c4%8dke-razvijenosti-za-2024-godinu,46.html , accessed 22nd November 2025
- https://www.dubrovnik.hr/vijesti/sampion-turizma-2024-18986 accessed 2th May 2025
- https://www.dubrovnik.hr/uploads/Izvjes%25C4%2587e-o-stanju-okolisa-Grada-Dubrovnika-za-2021.g_%25C4%258Distopis.pdf accessed 5th May 2025
- https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tourism_statistics, accessed 25th September 2025
- https://ec.europa.eu/eurostat/web/tourism, accessed 25th September 2025
- https://eizg.hr/userdocsimages/publikacije/serijske-publikacije/sektorske-analize/sa_turizam_2024.pdf, accessed 25th September 2025
- https://www.hgk.hr/vukojevic-istra-je-svjetionik-hrvatskoj-za-razvoj-premium-turizma, accessed 22nd November 2025
- https://horwathhtl.com/croatia/project/analysis-and-strategic-guidelines-for-the-upgrade-in-air-connectivity-of-the-istria-region/ accessed 15th December 2025
- https://hrturizam.hr/strani-radnici-u-turizmu-i-ugostiteljstvu-pad-od-oko-2500-radnih-dozvola-u-odnosu-na-2024, accessed 15th December 2025
- https://iztzg.hr/hr/novosti/predstavljena-regionalna-klimatska-strategija-turizma-zadarske-zupanije,4967.html , accessed 5th May 2025
- https://mint.gov.hr/UserDocsImages/1A_UPISNICI/241011_DZS_turizam_VIII.pdf, accessed 26th September 2025
- https://mint.gov.hr/UserDocsImages/2022_odrzivi_web/230926_medjuodnos_klime_t.pdf, accessed 26th September 2025
- https://mzozt.gov.hr/o-ministarstvu-1065/djelokrug/uprava-za-klimatsku-tranziciju-1879/strategije-planovi-i-programi-1915/strategija-prilagodbe-klimatskim-promjenama-republike-hrvatske/8351 accessed 26th September 2025
- https://op.europa.eu/webpub/mare/eu-blue-economy-report-2025/blue-economic-sectors/coastal-tourism.html, accessed 5th May 2025
- https://podaci.dzs.hr/hr/podaci/turizam/dolasci-i-nocenja-turista/ accessed 20th November 2025
- https://podaci.dzs.hr/2024/hr/76895 accessed 20th November 2025

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

- https://portsplit.hr/luka-split/statistike/ accessed 20th November 2025
- Strategija razvoja održivog turizma Republike Hrvatske, (2023). https://narodne-novine.nn.hr/clanci/sluzbeni/full/2023_01_2_18.html accessed 20th November 2025
- Strategija prilagodbe klimatskim promjenama u Republici Hrvatskoj (2020) https://narodne-novine.nn.hr/clanci/sluzbeni/2020_04_46_921.html accessed 21st November 2025
- https://www.tzgz.hr/informacije/dokumenti accessed 20th November 2025
- https://transport.ec.europa.eu/tourism/transition-eu-tourism/resilience-eu-tourism_en accessed 20th September 2025
- The Green Transition of Tourism, European Commission https://transport.ec.europa.eu/tourism/transition-eu-tourism/green-transition-tourism_en accessed 20th September 2025
- Tourism Transition Pathway, Co-creation and Co-Implementation Process, European Commission, https://transport.ec.europa.eu/tourism/transition-eu-tourism/tourism-transition-pathway-co-creation-and-co-implementation-process_en accessed 20th September 2025
- https://www.tzgz.hr/informacije/ostale-informacije/202510 accessed 20th September 2025
- https://www.uni.lu/en/news/the-dark-side-of-tourism/ accessed 20th November 2025
- https://vlada.gov.hr/vijesti/svjetska-turisticka-organizacija-partner-u-osnivanju-centra-za-odrzivi-turizam/42275?lang=hr accessed 20th November 2025
- https://www.zagreb.hr/userdocsimages/arhiva/statistika/2025/turizam%202025/Turizam%20IX.%202025_web.pdf accessed 20th November 2025
- https://zec.zagreb.hr/wp-content/uploads/2025/07/Program_ublazavanja_klimatskih_promjena_prilagodbe_klimatskim_promjenama_ accessed 20th November 2025
- https://zec.zagreb.hr/solarne-elektrane-na-javnim-zgradama-grada-zagreba/ accessed 22nd November 2025
- https://www.zelena-istra.hr/hr/articles/novosti/609/razvoj-turizma-uz-zastitu-prirode-i-okolisa-je-mog/ accessed 20th November 2025

Case study 14

Ančić, B., Cik, T., Grdenić, G., Holjevac, N., & Zidar, M. (2023). Energy transition between promises and realities – A view from the European semi-periphery. Sociologija i prostor, 61(3 (228)), 437–463.

Bouzarovski, S., Thomson, H., & Cornelis, M. (2021). Confronting energy poverty in Europe: A research and policy agenda. Energies, 14(4), 858. https://doi.org/10.3390/en14040858

Društvo za oblikovanje održivog razvoja (DOOR). (2024). Energy poverty and the private-rental sector: Case study Zagreb [ENPOR – Measures to alleviate energy poverty in the private-rental sector]. Retrieved from https://www.door.hr/wp-content/uploads/sites/8/2024/03/ENPOR-ZAGREB_compressed.pdf

Dubois, U. (2021). Introduction: Energy poverty and its drivers in post-communist Europe – the visible, the measurable, and the hidden (pp. 1–22). In G. Jiglau, A. Sinea, U. Dubois, & P. Biermann (Eds.), Perspectives on energy poverty in post-communist Europe. Routledge.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Grdenić, G., Delimar, M., & Robić, S. (2020). Framing the context of energy poverty in Croatia: A case study from Zagreb. Energy Policy, 147, 111889. https://doi.org/10.1016/j.enpol.2020.111889

Ministry of Economy and Sustainable Development. (2023). Draft update of the National Energy and Climate Plan of the Republic of Croatia for the period 2021–2030.

POWERPOOR Consortium. (2023). Report on the pilot support programmes [D6.6 Final publishable report]. Retrieved from https://powerpoor.eu/sites/default/files/2023-12/D6.6%20Final%20Publishable%20report%20V1.1.pdf

Robić, S. (2016, October). Energy poverty in Southeast Europe: Surviving the cold [Brochure]. SEE Change / Caritas. Retrieved from https://powerpoor.eu/sites/default/files/2022-07/Brosura_Caritas.pdf

Robić, S., & Ančić, B. (2018). Exploring health impacts of living in energy poverty: A case study of Sisak-Moslavina County, Croatia. Energy and Buildings, 169, 379–387. https://doi.org/10.1016/j.enbuild.2018.03.058

Vlahinić Lenz, N., & Grgurev, I. (2016). Energy poverty in Croatia: New insights (pp. 201–209). In J. Vopava, V. Douda, R. Kratochvil, & M. Konecki (Eds.), Proceedings of the 7th MAC 2016. Academic Conferences Association.

Case study 15

ADEME. (2023). *Coûts complets et recettes financières de la restauration scolaire : Quelles marges de manœuvre pour la transition écologique?* Retrieved from https://librairie.ademe.fr/agriculture-alimentation-foret-bioeconomie/6542-couts-complets-et-recettes-financieres-de-la-restauration-scolaire-quelles-marges-de-manoeuvre-pour-la-transition-ecologique-.html

Andhov, M., Kania, M., & Mikulic, S. (2024). How to procure sustainable food and include farmers in public procurement? Legal constraints and opportunities. https://doi.org/10.2139/ssrn.4826088

Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory, 18*(4), 543-571. https://doi.org/10.1093/jopart/mum032

Arrowsmith, S. (2010). Horizontal policies in public procurement: A taxonomy. *Journal of Public Procurement, 10*(2), 149-186.

Born, B., & Purcell, M. (2006). Avoiding the local trap: Scale and food systems in planning research. *Journal of Planning Education and Research, 26*(2), 195-207. https://doi.org/10.1177/0739456X06291389

Center for Disease Control and Prevention. (2024). *Benefits of healthy eating for children.* Retrieved from https://www.cdc.gov/nutrition/php/resources/healthy-eating-benefits-for-children.html

Cohen, J. F. W., Richardson, S., Austin, S. B., Economos, C. D., & Rimm, E. B. (2013). School lunch waste among middle school students: Nutrients consumed and costs. *American Journal of Preventive Medicine, 44*(2), 114-121. https://doi.org/10.1016/j.amepre.2012.09.060

Cook, J. T., & Frank, D. A. (2008). Food security, poverty, and human development in the United States. *Annals of the New York Academy of Sciences*, *1136*, 193–209. https://doi.org/10.1196/annals.1425.001

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Crowder, D. W., & Reganold, J. P. (2015). Financial competitiveness of organic agriculture on a global scale. *Proceedings of the National Academy of Sciences, 112*(24), 7611-7616. https://doi.org/10.1073/pnas.1423674112

Denzin, N. K. (2012). Triangulation 2.0. *Journal of Mixed Methods Research, 6*(2), 80-88. https://doi.org/10.1177/1558689812437186

Eating City. (2025). *Empowering food enablers – The Dordogne study case.* Retrieved from https://prezi.com/view/1WUtvymfHMvJA2x5j1IA/

Edwards-Jones, G., Milà i Canals, L., Hounsome, N., Truninger, M., Koerber, G., Hounsome, B., Cross, P., York, E. H., Hospido, A., Plassmann, K., Harris, I. M., Edwards, R. T., Day, G. A. S., Tomos, A. D., Cowell, S. J., & Jones, D. L. (2008). Testing the assertion that 'local food is best': The challenges of an evidence-based approach. *Trends in Food Science & Technology, 19*(5), 265-274. https://doi.org/10.1016/j.tifs.2008.01.008

EU CAP Network. (n.d.). *Thematic group on economic vulnerability of farming.* Retrieved from https://eu-cap-network.ec.europa.eu/thematic-groups-cap-implementation/thematic-group-economic-vulnerability-farming_en

European Commission. (2019). *The Green Deal.* Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_fr

European Commission. (2020). *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system.* Retrieved from https://food.ec.europa.eu/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf

European Commission. (2023). *Reform of the Common Agricultural Policy 2023–2027: Fairer, greener and more performance-based farming policy.* Retrieved from https://www.consilium.europa.eu/press/press-releases/2021/12/02/council-adopts-fairer-greener-and-more-performance-based-farming-policy-for-2023-2027/

European Commission. (2025). *Clean Industrial Deal: A plan for EU competitiveness and decarbonisation.* Retrieved from https://commission.europa.eu/topics/eu-competitiveness/clean-industrial-deal_fr

European Commission: Joint Research Centre. (2024). *Overview and analysis of sustainable product procurement criteria in the EU food sector*. Publications Office of the European Union. https://data.europa.eu/doi/10.2760/1286793.

Falvo, C. (2023). *Case study targeting 100% organic, local and homemade meals in Dordogne secondary schools* [Case study]. Sapiens Network. https://sapiensnetwork.eu/case-study-organic-local-meals-dordogne-secondary-schools/

Food and Agriculture Organization of the United Nations, Alliance of Bioversity International and CIAT, & Editora da UFRGS. (2021). *Public food procurement for sustainable food systems and healthy diets – Volume 1.* FAO. https://doi.org/10.4060/cb7960en

France. (2020). *Loi n° 2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire.* Retrieved from https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000041553759/

France. (2021). *Loi n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets.* Retrieved from https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043956924/

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Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance, 16*(2), 250-279. https://doi.org/10.1016/0030-5073(76)90016-7

He, F. J., & MacGregor, G. A. (2008). "Beneficial effects of potassium on blood pressure." - *Journal of the American College of Cardiology, 51*(13), 1298-1309.

Hodson, R. (2001). *Dignity at work*. Cambridge University Press

Kristjansson, E. A., Robinson, V., Petticrew, M., MacDonald, B., Krasevec, J., Janzen, L., Greenhalgh, T., Wells, G., MacGowan, J., Farmer, A., Shea, B. J., Mayhew, A., & Tugwell, P. (2007). School feeding for improving the physical and psychosocial health of disadvantaged elementary school children. *Cochrane Database of Systematic Reviews, 1*, CD004676. https://doi.org/10.1002/14651858.CD004676.pub2

Low, S. A., & Vogel, S. (2011). Direct and intermediated marketing of local foods in the United States. *USDA Economic Research Service ERR-128*.

Morgan, K., & Sonnino, R. (2008). *The school food revolution: Public food and the challenge of sustainable development.* Earthscan.

Newell, P., & Mulvaney, D. (2013). The political economy of the 'just transition'. *The Geographical Journal, 179(*2), 132-140. https://doi.org/10.1111/geoj.12008

Nilsson, M., Zamparutti, T., Petersen, J. E., Kykvist, B., Rudberg, P., & McGuinn, J. (2012). Understanding policy coherence: Analytical framework and examples of sector–environment policy interactions in the EU. *Environmental Policy and Governance, 22,* 395–423.

Notarnicola, B., Sala, S., Anton, A., Mclaren, S., Saouter, E., & Sonesson, U. (2017). The role of life cycle assessment in supporting sustainable agri-food systems: a review of the challenges. *JOURNAL OF CLEANER PRODUCTION,* 140, 399-409

Nyaradi, A., Li, J., Hickling, S., Foster, J., & Oddy, W. H. (2013). The role of nutrition in children's neurodevelopment: Updates on dietary components and cognitive outcomes. *Nutrients, 6*(11), 5147-5164.

Ozer, E. J. (2007). The effects of school gardens on students and schools: Conceptualization and considerations for maximizing healthy development. *Health Education & Behavior, 34*(6), 846-863. https://doi.org/10.1177/1090198106289002

Ratcliffe, M. M., Merrigan, K. A., Rogers, B. L., & Goldberg, J. P. (2011). The effects of school garden experiences on middle school-aged students' knowledge, attitudes, and behaviors associated with vegetable consumption. *Health Promotion Practice, 12*(1), 36-43. https://doi.org/10.1177/1524839909349182

ReFED. (2016). *A roadmap to reduce U.S. food waste by 20 percent*. Retrieved from: https://refed.org/downloads/ReFED_Report_2016.pdf

Renting, H., Marsden, T. K., & Banks, J. (2003). Understanding alternative food networks: Exploring the role of short food supply chains in rural development. *Environment and Planning A, 35*(3), 393-411. https://doi.org/10.1068/a3510

Stein, M., Mariani, M., Caranta, R., & Polychronakis, Y. (Eds.). (2024). *Sustainable food procurement: Legal, social and organisational challenges.* Oxford, United Kingdom: Routledge.

Valette, É., Blay-Palmer, A., Chaboud, G., Di Battista, A., Intoppa, B., & Roudelle, O. (2023). *Evaluating sustainable food system innovations: A global toolkit for cities.* Oxford, United Kingdom: Routledge.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.

Vola, P., Gelmini, L., Rossa, S., Falvo, C., Hrušková, M., & Plaček, M. (2025). Innovating public food procurement: A case study of Dordogne's path to sustainability. *Review of Policy Research,* 1–13. https://doi-org.lse.idm.oclc.org/10.1111/ropr.70026

Vidgen, H.A., & Gallegos, D. (2014) Defining food literacy and its components ;*Appetite, Elsevier* https://doi.org/10.1016/j.appet.2014.01.010

Ratcliffe, M. M., Merrigan, K. A., Rogers, B. L., & Goldberg, J. P. (2011). The effects of school garden experiences on middle school-aged students' knowledge, attitudes, and behaviors associated with vegetable consumption. *Health Promotion Practice, 12*(1), 36-43. https://doi.org/10.1177/1524839909349182

Sonnino, R. (2009). Quality food, public procurement, and sustainable development: The school meal revolution in Rome. *Environment and Planning A, 41*(2), 425-440. https://doi.org/10.1068/a40112

Stevenson, G. W., & Pirog, R. (2008). Values-based supply chains: Strategies for agrifood enterprises of the middle. In T. A. Lyson, G. W. Stevenson, & R. Welsh (Eds.), *Food and the mid-level farm: Renewing an agriculture of the middl*e (pp. 119-143). MIT Press.

Swenson, D. (2009). Investigating the potential economic impacts of local foods for Southeast Iowa. *Leopold Center for Sustainable Agriculture*.

Testa, F., Iraldo, F., Frey, M., & Daddi, T. (2012). What factors influence the uptake of GPP (green public procurement) practices? New evidence from an Italian survey. *Ecological Economics, 82*, 88-96. https://doi.org/10.1016/j.ecolecon.2012.07.011

Uttley, S. (1997). Lot division in public procurement. *Public Procurement Law Review, 6*, 188-195.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No 101112305.