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JUST TRANSITION PATHWAYS

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Introduction

Abstract

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.

Keywords

Decarbonization; phase-out; mining; thermal power; labour restructuring.

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1 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. 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 '.

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

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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.

2 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'.

This case study seeks to understand how affected communities perceive just transition policies, including their adequacy and fairness, local concerns and expectations, and

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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

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subset of the population traditionally ignored when researching contexts where male-dominated jobs are at stake.

3 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 '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 1.

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Table 1. 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 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.

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4 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[1]. 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[2].

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).

[1] Source: Red Eléctrica de España (https://www.ree.es/es/datos/generacion)
[2] 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).

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Figure 1. Geographical location and scope of the JTAs

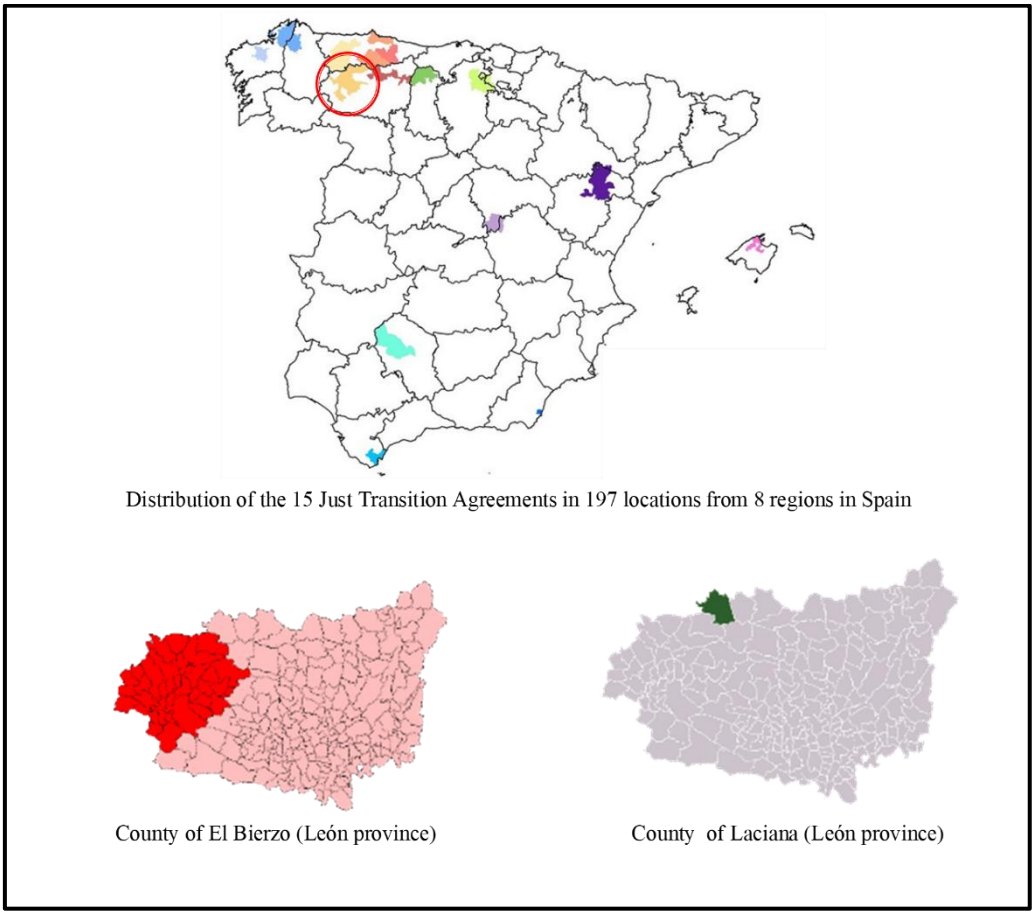

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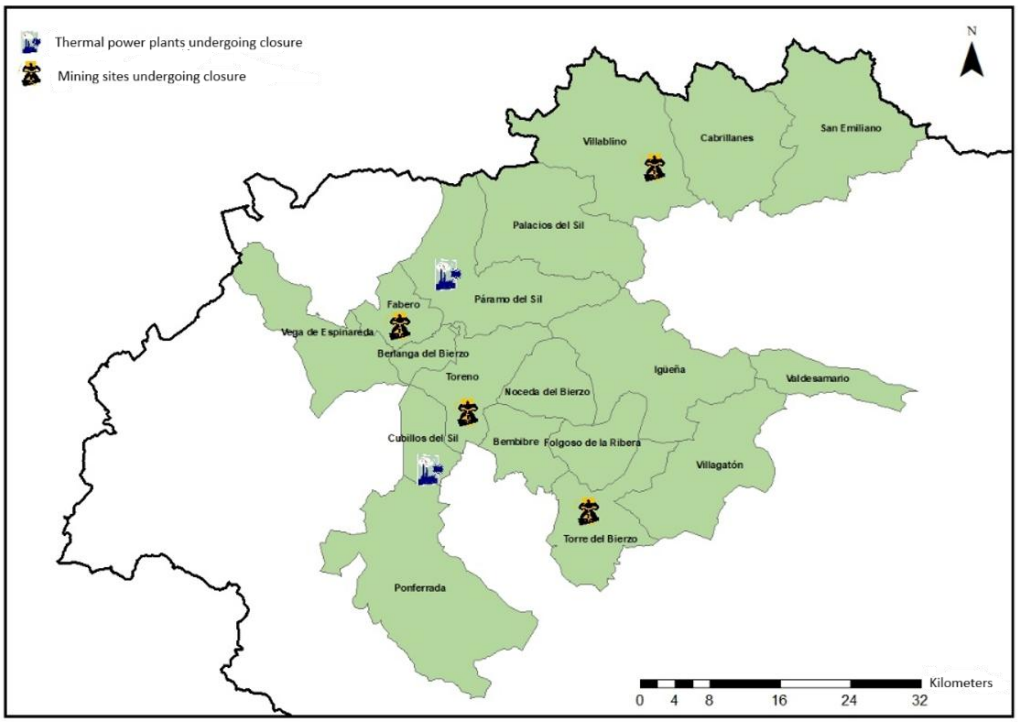
Figure 2. Subset of locations included in the Just Transition Agreement Bierzo-Laciana



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 2). 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 2. Population and unemployment in the 18 locations included in the JTA-El Bierzo-Laciana[3]

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

a) 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

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

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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.

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.

b) 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.

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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 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.

c) 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

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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.

d) 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

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requalification would help the workers and future generations to have an income source, but not necessarily to fix population on the affected areas.

e) 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[4], 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 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.

[4] 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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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'.

5 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:

a) **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.

b) **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.

c) **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.

d) **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.

e) **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.

These categories can be bound to the main **socio-environmental justice dimensions**, already explained in the Deliverable 1.2[5]. The socio-environmental justice approach

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

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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)[6]: **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 3 summarizes the findings and lists these links.

Table 3. 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
a) 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

[6] 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
b) Productive and social fabric	• False diversification dragged from past plans • Projects lack viability and continuity • Dependence on subsidies and 'smoke' investments • Need for medium/large industrial projects • Infrastructure and bureaucratic hurdles • Need for monitoring and follow-up of projects	**Procedural justice:** Problems in the planning, feasibility and monitoring of projects, as well as bureaucratic obstacles. It points to failures in the processes of governance and participation, central elements of procedural justice.	Loss and damage
c) 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

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CATEGORY	MAIN FINDINGS	SOCIO-ENVIRONMENTAL JUSTICE DIMENSIONS	PROCESSES OF SOCIAL IMPACT
d) 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
e) 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

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

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where coal extraction and combustion was 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.

6 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

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mechanisms delivered by the structures of a sound democracy. Such a pessimistic landscape, feeding the pessimistic 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

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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 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.

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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.

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.

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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 (Müller, 2024; Venditto & Kamwanyah, 2025).

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.

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7 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 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

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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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