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Introduction

1 Growing concerns about climate change and geopolitical risks have elevated energy to a critical societal issue, highlighting the need to transition away from fossil fuels. For decades, this energy transition challenge has been predominantly addressed through a techno-economic perspective, relying heavily on the invisible hand of the market (Cherp *et al.*, 2018). Early socio-centred critiques began to point out major shortcomings of this market-based approach, particularly the persistence of energy poverty and unjust distribution of (financial) access to domestic energy services (Walker & Day, 2012). Yet, even these approaches often remained confined within an aspatial and ahistorical framing, viewing producers and consumers as abstract actors operating within the market (Bouzarovski & Simcock, 2017). This paper seeks to contribute to the emerging body of scholarship that is "spatializing energy justice" (Bouzarovski & Simcock, 2017), by integrating socio-spatial and temporal dimensions in the analysis of the ongoing energy transition. Building on the energy geographies literature, we conceptualise the energy transition as an inherently geographical process that reconfigures the socio-spatial organisation of the energy system and wider society (Bridge *et al.*, 2013). The ongoing transition process interacts with place-specific historical path-dependencies, creating new patterns of uneven development with regional winners and losers (Bridge & Gailing, 2020). In that way, our spatial approach to energy justice intersects with contemporary debates on 'left behind places' more generally, referring to places that are characterised by socio-economic decline, cultural marginalisation and political neglect (MacKinnon *et al.*, 2022). On the one hand, the uneven development associated with the energy transition threatens to create new left behind places. This vulnerability exists especially for regions whose economies have

been historically built around the production of fossil fuels, making the issue of a just transition especially salient. On the other hand, the new demand for renewable energy infrastructures and green technology manufacturing is also seen as a development opportunity for formerly left behind places (Langguth, 2025). The relationship between the energy transition and left behind places is, in other words, multi-directional and its (justice) outcomes contingent on the way peripheralization processes are being reinforced or undermined by the dynamics of a new round of uneven development.

2 This paper takes the case of the German part of the lignite-mining region of Lusatia as an entry point to unravel the mutual relations between processes of uneven development, peripheralization and energy (in)justice. It traces Lusatia's transformative journey through successive rounds of uneven development and reflects on the energy justice implications of these developments through the dimensions of distributional, procedural and recognitional justice.

3 From the 19th century onwards, Lusatia industrialised thanks to its abundant lignite deposits. After World War II, the region consolidated its core position and became the cornerstone of energy security in the autarkic, socialist German Democratic Republic (GDR) in Eastern Germany. However, German reunification and the subsequent shift from a planned to a free-market economy in the 1990s prioritised competitiveness over autarchy, causing lignite production and employment to plummet. Since then, Lusatia has struggled with socio-economic challenges as a peripheral region within the unified, capitalist Germany.

4 Throughout Lusatia's history, the social and environmental burdens of economic restructuring have consistently fallen on marginalised communities: from native Slavic communities displaced by the sustained expansion of mining operations, to former GDR miners who lost their jobs. Today, recent EU and federal coal phase-out policies have once again placed Lusatia at a critical juncture. Will these policies deepen existing marginalisation, or can the associated influx of public investments in renewable energy, infrastructure and workforce transition offer a path toward revitalisation?

The links between uneven development, peripheralization and energy justice

5 Environmental justice scholarship highlights how environmental harms are unequally distributed across social groups (Schlosberg, 2004, 2007), often affecting vulnerable communities in both the Global North and Global South. Rooted in place-based conflicts like the 1980s Warren County protests against environmental racism, the field has evolved to frame justice as both context-specific and universally relevant (Sikor, 2013; Agyeman *et al.*, 2016; Coolsaet, 2020; Busscher *et al.*, 2020). Key concerns include the distribution of harms and benefits, participation in decision making, procedural fairness, and cultural recognition, all interlinked dimensions crucial to understanding more recent debates on energy justice.

6 The concept of energy justice builds further on this environmental justice tradition, giving particular attention to the energy challenge (McCauley *et al.*, 2013). Energy justice recognises the profound societal impacts of the energy sector, spanning environmental sustainability, public health, economic development, and social well-being (Newell & Mulvaney, 2013; Sovacool & Dworkin, 2015; Jenkins *et al.*, 2016). Central

to energy justice is the equitable distribution of benefits and burdens associated with the energy transition, ensuring that all members of society are fairly treated and included in its outcomes (Sovacool & Dworkin, 2015; McCauley & Heffron, 2018). While energy transitions are often framed as technical and economic transformations (Newell & Mulvaney, 2013), scholars have highlighted how economically driven policymaking can exacerbate social and spatial inequalities (Heffron & McCauley, 2018; Wang & Lo, 2021). Over the past decade, increasing attention has therefore been given to the socio-spatial and socio-environmental dimensions of energy transitions, emphasising the interplay of economic structures, power relations, and temporal and spatial inequalities (Newell & Mulvaney, 2013; Wang & Lo, 2021).

7 Further elaborating on environmental justice scholarship, the framework of energy justice identifies three interconnected dimensions: distributional justice, recognitional justice and procedural justice. Distributional justice ensures the fair allocation of the energy systems' benefits and burdens across social groups and the environment (Sovacool & Dworkin, 2015; Bouzarovski & Simcock, 2017). What can be considered a fair allocation not only depends on the present distribution, but also on past histories of systemic inequalities. Recognitional justice therefore particularly addresses the rights and histories of marginalised communities and challenges cultural domination (Fraser, 1998; Jenkins *et al.*, 2016). In addition to recognising marginalised communities' needs, achieving a fair allocation is contingent on ensuring inclusive, participatory decision-making. Procedural justice therefore emphasises transparent and inclusive decision-making processes in energy governance (Jenkins *et al.*, 2016; McCauley *et al.*, 2019). Without fair procedures, actors cannot speak up and weigh on distribution and recognition debates, demonstrating the intrinsic link between these three dimensions in achieving energy justice.

8 This study applies these dimensions to analyse the historical, spatial, and institutional implications of the energy transition, with a particular focus on understanding regional disparities and governance processes. The energy transition exerts significant pressure on regional economies historically dependent on fossil fuels (Blondeel *et al.*, 2021). Already peripheral regions are particularly vulnerable to the political-economic restructuring associated with the shift towards low carbon energy systems. Understanding socio-economic disparities and the underlying processes of peripheralization is therefore essential to recognising – and ultimately addressing – the historical marginalisation of these regions as part of an energy justice agenda. The confluence of energy justice and peripheralization thus emerges as a critical lens through which to analyse the complex interplay between socio-economic disparities, policy formulations, and societal transformations. Both energy justice and peripheralization issues are rooted in processes of uneven development. This paper focusses on two key dynamics driving uneven development: capital flows and path-dependency.

9 Flows of capital create cycles of investments and disinvestment in different regions, leading to the uneven distribution of financial assets across time and space (Hudson, 2020). This dynamic contributes to the emergence of centralisation and peripheralization, creating investment-rich 'centres' and disinvestment-prone (resource) 'peripheries'. Resource peripheries supply essential inputs to the core, yet the latter captures the highest share of value created along the supply chain thanks to the concentration of ownership and R&D there (O'Sullivan *et al.*, 2020). Due to this

power imbalance, peripheral development trajectories remain dependent on external investments from the core, rendering them vulnerable when these investments dry up. Scholars often describe this as the 'see-saw' or 'boom-bust' effect, wherein profit-seeking capital is attracted to profitable places but subsequently erodes the place-specific conditions that made them profitable. This eventually prompts capital outflows and an economic downturn in peripheries that were completely geared towards this resource supply (Smith, 1984; Hudson, 2015). Such patterns generate distributional justice issues, as social and environmental costs are externalised, leading to the uneven distribution of gains, opportunities and environmental harms (Smith, 1984; Hudson, 2015). In the context of the energy system, this can manifest in unequal and inadequate job opportunities, deficient infrastructure, environmental damage, and knowledge gaps.

10 A second fundamental dynamic of uneven development is path-dependency, which refers to the self-reinforcement of historically made decisions (Becker *et al.*, 2016). Through positive feedback mechanisms, existing socio-economic inequalities are reproduced and solidified over time, structuring future development trajectories (Becker *et al.*, 2016). Three main self-reinforcing mechanisms are at play: increasing returns, complementarity and power (Beyer, 2010). Increasing returns refers to the maximisation of profit by adhering to previously established assets and infrastructures (Beyer, 2010; Garud *et al.*, 2010). Thus, path-dependency and capital flows are closely intertwined. Complementarity-based path dependency describes how mutually enhancing features within a system reinforce its persistence (Beyer, 2010). For example, in terms of the energy system, this could relate to infrastructure that can be adapted to different energy sources. Lastly, the power mechanism highlights the role of powerful actors seeking to maintain their influence (Beyer, 2010).

11 Path-dependency can enhance processes of peripheralization and centralisation in the context of the energy system, as the reliance of regions on the fossil fuel industry is shaped by historical decision-making, creating optimal conditions for the industry's continued development. Usually, due to this path-dependency, these regions face increased challenges in transitioning away from the fossil fuel model. These dynamic raises critical energy justice concerns, as it results in the uneven distribution of transition-related burdens, such as job losses in fossil fuel-based industries and the centralisation of new opportunities around technological innovation in the energy sector (Kühn, 2015; Pollin, 2023).

12 Furthermore, path-dependency can shape socio-cultural relationships by influencing how a region's culture, social practices and norms are perceived by both in-and outsiders (Huggins *et al.*, 2021). The collective memory of industrial decline shapes local identities and impacts how these communities perceive their place in the world, determining how their response to change (Halford *et al.*, 2025). Additionally, outside perceptions may stigmatise places and populations, further reinforcing peripheralization (Kühn, 2015). Recognitional justice issues can arise, when the historical roots of a region's dependence on outdated practices are overlooked, particularly when long-standing cultural identities and institutions have been formed around these practices (Hassink, 2010). This can potentially lead to biases in policymaking and decision-making processes. It is therefore crucial to understand how regions are socially and culturally represented in relation to the energy system, how

this representation influences policy and local agency, and how the energy transition can reshape a region's identity and opportunities.

13 Ultimately, the intricate links between uneven development, peripheralization, and energy justice are both the outcome and the terrain of policy and decision-making. Policy interventions can either facilitate or reinforce the capital-driven process of uneven development or mitigate these underlying dynamics. Peripheralization often generates political pressure, prompting shifts in resource allocation, government spending and political action (Hudson, 2020). To harness policymaking as a tool to counteract uneven development, it is crucial to foreground the dimension of procedural justice, ensuring that the most vulnerable groups and regions are meaningfully included in decision-making process.

Study area and methodology

14 This section outlines the background of the case-study and explains the methodological approach adopted in the research.

Introduction to the case-study

15 Lusatia, known as Lausitz in German and Łužica/Łužyca in Sorbian/Wendish, is a historic lignite mining region spanning parts of Germany and Poland, and bordering the Czech Republic. It is characterised by its rich cultural heritage, inter-regional complexity, and long-standing reliance on lignite mining (Gürtler & Herberg, 2023). The region is home to the Sorbian/Wendish ethnic minority, who have preserved their language, traditions, and customs despite centuries of German influence, making Lusatia culturally diverse and multilingual (Bresan *et al*., 2020; Gürtler & Herberg, 2023). Over time, this community has faced significant challenges linked to political and energy-related developments (Elle, 2004; Bresan *et al*., 2020), positioning them as a crucial actor in debates around energy justice.

16 The German part of Lusatia (from now on 'Lusatia') spans the federal states of Saxony in the south and Brandenburg in the north, creating administrative complexity (see Figure 1). Limited cross-border coordination and diverging strategic approaches have led to fragmentation risks and posed challenges for region-wide structural change initiatives (Matern *et al.*, 2024). The region has long served as an industrial hub, most notably for lignite mining, which has significantly shaped its economy and territory (Seibert *et al*., 2018; Ragnitz *et al*., 2021). During the GDR era, in which Eastern Germany was a socialist state, Lusatia played a central role in national energy security, with the lignite sector employing approximately 80,000 people (Statistik der Braunkohlewirtschaft, 2025b). Since reunification with the Federal Republic of Germany (FRG) in 1990, employment in the sector has declined sharply (Statistik der Braunkohlewirtschaft, 2025b). Today, four opencast lignite mines remain active in this predominantly rural and often-perceived peripheral region (Ragnitz *et al.*, 2021; Matern *et al.*, 2023; Pomp, 2024). Given its historical dependence on lignite, Lusatia is especially vulnerable to the ongoing energy transition (Schulz & Schwartzkopff, 2018), making it a particularly relevant case study for examining how federal and European fossil phase-out policies translate at the local level.

Figure 1. Administrative situation of Lusatia in Germany.



Source: authors based on open data from Geoportal.de

Methodology, tools for data collection and analysis

17 This research employed a qualitative case-study design (Fetters & Molina-Azorin, 2017), mobilising our conceptual framework for an in-depth analysis of different empirical data sources, including secondary 'grey literature', statistics, geo-spatial data, and interviews with key actors. This combination of multiple methods and data sources allowed both triangulation of results and complementary insights.

18 Secondary data were drawn from EU and German policy documents, reports, local media, academic literature, and geographic data repositories. Key sources included the *Investitionsgesetz Kohleregionen* and the associated *Leitbild zum Lausitzer Revier* (Strategic Vision for the Lusatian Region), the European Green Deal and its Just Transition Mechanism, and scientific literature, all of which offered insights into the socio-economic shifts triggered by European and federal coal phase-out policies. Historical and recent socio-economic and environmental statistics were obtained from the *Statistik der Kohlewirtschaft e.V.* Geographic data from the Copernicus Land Monitoring Service (CORINE), *Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft, Energieportal Brandeburg, GeoMIS Sachsen* and *Open Street Map* were used to map the evolution of land-use and energy infrastructures in Lusatia using QGIS. These sources enabled a spatial and socio-economic analysis of the transformation of socio-environmental configurations in Lusatia.

19 This analysis was complemented by in-depth online interviews conducted between February and April 2024. Examples of four types of actors were purposefully selected as interviewees to shed further light on the observed dynamics based on their personal

experiences within the local reality of Lusatia's energy landscape: 1) lignite workers, through the eyes of a veteran power plant worker with 40 years of experience; 2) the Sorbian/Wendish community, via the voice of a staff member of an NGO that advocates for the community's rights; 3) renewable energy developers, through the voice of a manager from a renewable energy agency, and; 4) the regional state, via a civil servant from the Ministry for regional development. Interviews were recorded, transcribed, and translated into English for thematic analysis, following Braun and Clarke's (2006) framework. These interviews do not aim at generalisation or statistical representativeness for the wider population of the identified actor types; rather, they introduce voices that are usually less prominent in academic and grey literature. By connecting these overlooked voices with the secondary sources and spatial mapping, the broad historical developments in Lusatia could be reconstructed through the lens of energy justice.

20 The focus of this paper is the reorganisation of socio-spatial relations associated with the transition in Lusatia, Germany, particularly the interaction between multi-level energy-climate governance and regional development, and on their implications for energy (in)justice. The coding process was informed by both theoretical concepts and emergent patterns identified in policy documents, secondary sources, and interview transcripts. The analysis was guided by an operationalisation of the 'energy justice-peripheralization concept', structured around six analytical categories: distributional justice, procedural justice, recognitional justice, in- and outflows of capital, stigmatisation, and path-dependency. Recurring themes were extracted, organised, and cross-validated across primary and secondary sources. Together, these methods and analytical categories enabled the analysis of the systemic and spatial patterns shaping Lusatia's energy transition.

Tracing Lusatia's development trajectory through the lens of peripheralization

21 This section examines the transformative journey of Lusatia from an industrial cornerstone to a region grappling with socio-economic challenges and reflects on the energy justice implications of these developments. It begins with a historical overview, tracing the onset of industrialisation in the 19th century, when the region - home to the Sorbian/Wendish people - underwent significant structural changes due to lignite mining. The analysis then shifts to the post-reunification era, during which economic transformations led to the closure of many lignite plants, accelerating Lusatia's transformation from a core industrial area to a peripheralized region.

22 In the first half of the 19th century, Lusatia, home to the Sorbian/Wendish people, a west-Slavic ethnic group, underwent significant structural changes due to industrialisation. This process, particularly the sustained grabbing of rural land for lignite mining, disrupted Sorbian/Wendish communities, displacing entire villages, undermining agriculture and ultimately dismantling the local socio-economic fabric, along with the spaces in which the culture and language were traditionally practiced (Keller & Jacobs, 2021; Jacobs, 2021). Figure 2 shows the historical expansion of mining lands that drove this displacement. As one Sorbian/Wendish representative described:

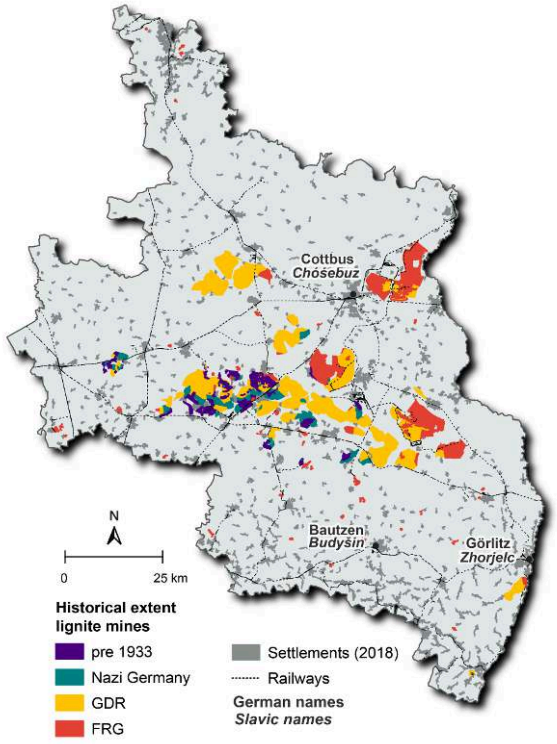
> "Most of the time it was the case that they [the displaced people] were then resettled in cities in prefabricated buildings [...] and accordingly the culture was

> lost, the language was lost and everything around it was unfortunately lost. Today, two generations of native speakers have really been lost due to this structural change, which is sad for us." (04/2024)

23 While the industrial boom brought economic benefits and attracted skilled workers and capital to the region, this influx – primarily of German native speakers – further marginalised the Sorbian/Wendish community, culture and language (Jacobs, 2021). During the era of national autarchy under Nazism and throughout the GDR period, Lusatia became a key energy hub, reinforcing its social and political significance (Baumert, 2021; Gürtler & Herberg, 2023). This in turn shaped the region's collective identity (Jacobs, 2021), as reflected in the words of a political representative:

> "[...] Lusatia was the most central core of energy supply [in the GDR]. This is reflected a bit in the mentality, in the self-perception, [...] of this region. [...] the people are incredibly proud of what they achieved, what they did back then." (04/2024)

Figure 2. Historical expansion of land-use for mining in Lusatia.



Source: authors based on geoportal Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft and Copernicus Land Monitoring Service.

24 The industrialisation of Lusatia, which culminated in its central role within the GDR, was a socially differentiated process. While newcoming German-speaking populations benefitted from new jobs and infrastructure, Sorbian/Wendish communities faced exclusion, displacement, cultural erosion and existential threats. These social disparities can be considered expressions of energy injustice. The injustices have a clear distributive dimension, with the burdens of the lignite-based energy system falling on Sorbian/Wendish population. They also carry a recognitional dimension, stemming from the disruption of traditional cultural practices and the broader Sorbian/Wendish collective identity. Together, these intertwined dynamics have

contributed to the historical marginalisation of the Sorbian/Wendish communities, making their needs an essential concern for energy justice today.

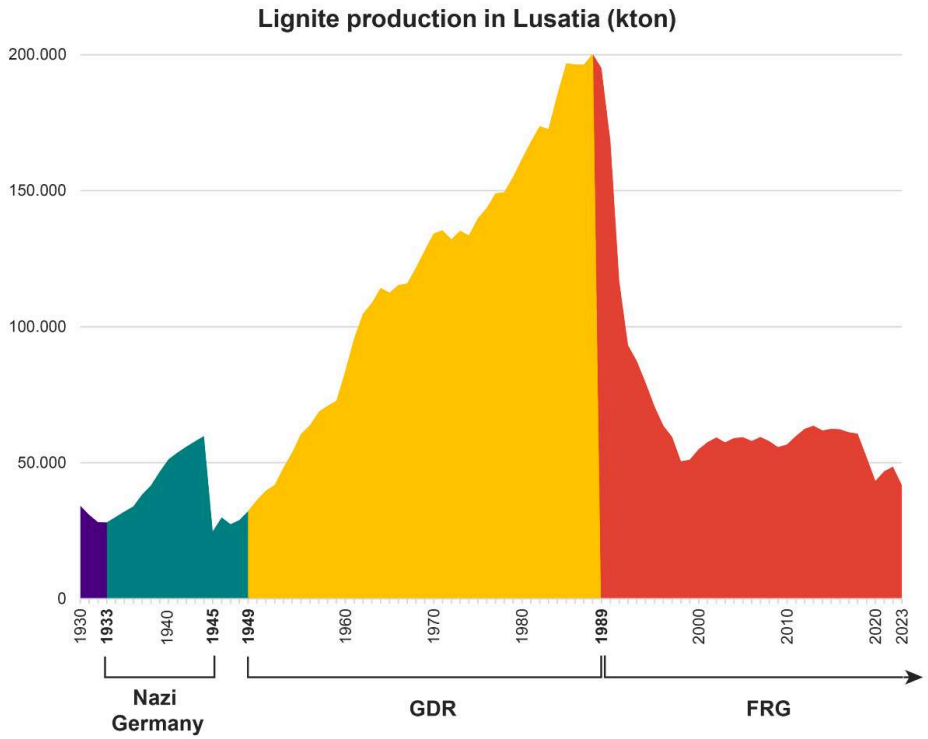
25 The reunification of Germany marked another profound transformation for Lusatia, giving rise to new forms of energy injustice. Many opencast lignite mines in East Germany were closed due to economic and social pressures associated with adapting to a capitalist system (Öko-Institut, 2017). These pressures arose from the shift from a planned economy to a free market, which rendered lignite mining uncompetitive due to the high investment required (Ragnitz *et al.*, 2021). At the same time, mass privatisation of land and mines favoured large corporations, resulting in highly concentrated patterns of land ownership that persist today (Ragnitz *et al.*, 2021). As a result of this political-economic transformation, lignite production and employment in the industry declined sharply (Figure 3 and 4), profoundly impacting the region's economy and collective memory. According to a political representative

> "[...] that really was a traumatic experience [...]."

26 The rapid economic restructuring led to significant out-migration, still remembered as a traumatic turning-point, as captured in the reflection of a power plant worker:

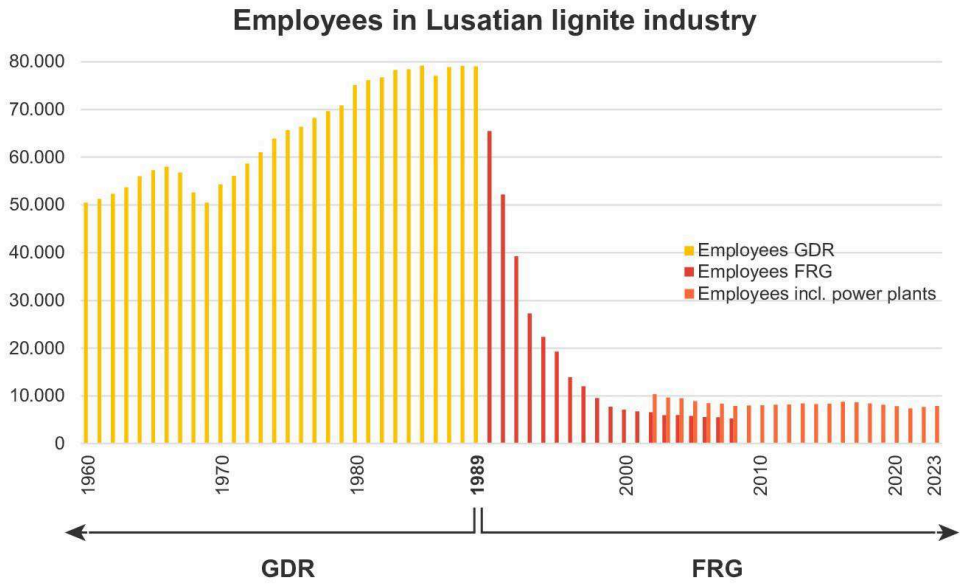
> "I think Hoyerswerda here in northern Saxony used to have 70,000 inhabitants. It is now at 33,000 or so, so what, what, what is a turning point? What else is supposed to happen now [...]?" (02/2024)

Figure 3. Lignite production in Lusatia 1930 – 2023.



Source: authors, based on Statistik der Kohlewirtschaft e.V., 2025a.

Figure 4. Employees in Lusatia's lignite industry 1960 – 2023.



Source: authors, based on Statistik der Kohlewirtschaft e.V., 2025b.

27 The outflow of financial and human capital initiated a process of peripheralization that continues to shape Lusatia today. The region is currently affected by demographic shrinkage and an aging population, with GDP per capita remaining low compared to Western Germany (Royer & Leibert, 2024). Peripheralization has been accompanied by stigmatisation. East Germans experienced what has been referred as 'status-related declassification', as their education and qualifications were undervalued, leading to workforce stigmatisation (Mayer, 1991, p. 92; Gürtler & Herberg, 2023). At the regional level, Lusatia suffers from negative media portrayals rooted in economic, social and political stereotypes of the region and East Germany as a whole (Glück, 2021; Heer, 2023). As the Sorbian/Wendish representative explains:

> "A lot of things have been ruined by the media. For the last 15 years, it [Lusatia] has always been called "Dark Germany", and the East Germans earn less than the West Germans. And our fellow citizens [...] have internalised it. They think: 'We are the worst ones here in Germany, we are doing badly.'" (04/2024)

28 This portrayal oversimplifies the reality, as there are multiple local economic centres within the region, either linked to active mines or situated near urban agglomerations of Berlin or Dresden (Maaßen, 2020). The persistence of this stereotype fuels frustration among residents and contributes to growing distrust in political decision-making. This discontent has been effectively leveraged by the far-right party Alternative für Deutschland (AfD), which gained substantial electoral support in Lusatia during the 2021 and 2025 federal elections, consistently securing between 20 and 45% of the votes.

29 The German-speaking population of Lusatia transitioned within a generation from being the backbone of the GDR economy to feeling left behind (Ragnitz *et al.*, 2021; Gürtler & Herberg, 2023). While privatization and the ensuing rationalization made the lignite-based energy system more profitable for its new owners, the burden of this reorganisation was borne by the workforce (Ragnitz *et al.*, 2021). Of the nearly 80,000

miners in 1989, fewer than 8,000 remained a decade later (Figure 4). Beyond the distributive injustice of losing stable employment, the recognitional injustice of stigmatisation and the erosion of regional pride and identity has deepened the feelings of energy injustice (Mayer, 1991; Gürtler & Herberg, 2021). The ongoing stigmatization of the region and its inhabitants reproduces the cycle of peripheralization by discouraging both investment and in-migration (Seibert *et al.*, 2018; Ragnitz *et al*., 2021; Matern *et al*., 2023). The reunification of Germany thus set in motion a complex interplay of economic, social, and political forces that transformed Lusatia and marginalised its workforce. The marginalisation from this period adds another historical layer that must be acknowledged in current efforts to pursue energy justice.

30 For the Sorbian/Wendish population, reunification did not halt the dislocation caused by mining. Despite reduced production, lignite remains sufficiently important in Germany's energy mix to justify continued excavations, which disproportionately affect Sorbs/Wends. Although legal avenues to challenge village demolitions were gained, these efforts often failed due to lignite mining's perceived national importance (Noack and Others *vs.* Germany, 2000). A Sorbian/Wendish representative described their political strategy:

> "[...] we positioned ourselves politically in the direction that we said ok, we have to accept that the village is being demolished. We won't be able to do much about it now, but our goal now is that we will then, above all, speak to politicians and also to the companies that are mining this lignite, we have entered into negotiations with them [...]" (04/2024)

31 The cultural and territorial rights of the Sorbs/Wends' continue to be subordinated to broader economic interests. As a result, their historical marginalisation still has remained unrecognised by broader German society and politics (Jacobs, 2021).

The ongoing reorganisation of Lusatia's energy spaces: combining old and new

32 The renewable energy transition, primarily driven by European and federal policies, brings yet another round of political and economic restructuring to the region. This section examines how the processes of the energy transition interact with Lusatia's path-dependencies, forming place-specific articulations between the remnants of the old coal-based energy system and emerging renewable-oriented elements. These dynamics of uneven and combined development underpin the ongoing, open-ended process of the reorganisation of socio-spatial relations within the region's energy system and wider economy (Bridge & Gailing, 2020).

33 Germany has been one of the frontrunners of the energy transition. It already developed a feed-in tariff mechanism to support the production of renewable electricity in 1991, long before the first EU directive 2001/77/EC promoting renewable energy in electricity generation (Böringher *et al.*, 2017). While the German energy transition, dubbed *die Energiewende,* was renowned for its growth of renewables, it was also controversial. The growth of renewables only compensated for the phasing out of nuclear power generation. As a result, the country remained dependent on carbon-intensive coal for its electricity generation (Renn & Marshall, 2016).

34 Boosted by broader EU climate policy initiatives such as the European Green Deal (2019), the German federal government eventually passed the coal phase-out law,

Kohleausstiegsgesetz (KohleAusG), in January 2020. Through this law, the government committed to ending coal-fired power generation by 2038 (§2(2) KohleAusG, 2020). Recognising the profound socio-economic impacts on already peripheral coal regions, the coal-phase out law was accompanied by the *Investitionsgesetz Kohleregion* (InvKG) in August 2020. This investment act channels federal funds to promote alternative economic growth in affected coal regions. Under the InvKG, up to 14 billion euros have been earmarked for regional financial aid in the federal budget for the period 2020-2038.

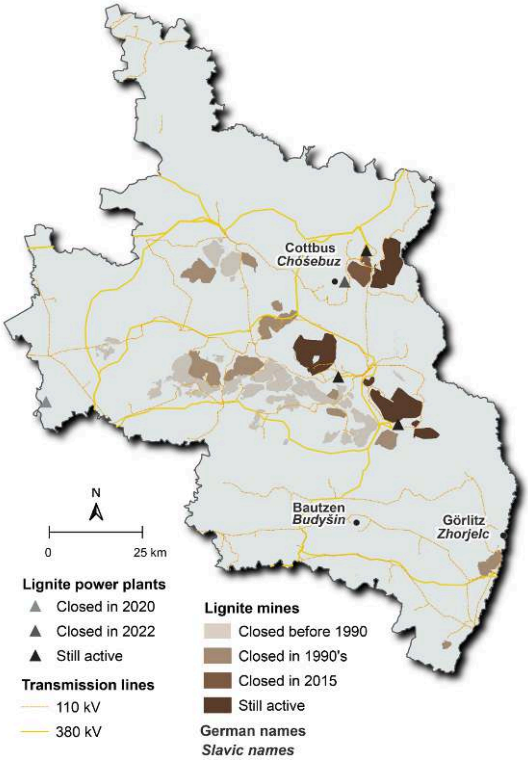
35 The largest share (43%) of this funding is allocated to Lusatia. To guide the use of these funds, the federal government and the regional governments of Saxony and Brandenburg jointly defined a set of principles and thematic priorities. Together, these form the *Leitbild,* or the strategic vision, for the future development of the region, which is legally enshrined as an annex to the InvKG. The central aim of the *Leitbild* is to increase Lusatia's economic competitiveness, building on its existing strengths as an energy region at the heart of Europe. Even after the coal phase-out, the energy sector is expected to remain a core part of the regional economy. Existing expertise and (infra)structures in energy generation and technology are to serve as building blocks for a future energy system oriented towards renewable electricity and green hydrogen production (InvKG Annex 1, 2020; Hölzinger *et al.*, 2021; Bode *et al.*, 2024).

36 A renewable energy advocate expressed this high-level vision in more practical terms during our interview:

> "[...] the region has large mining areas [...] to set up wind turbines or PV systems or something similar there. In addition, you of course have good connection options to the energy network [...]. [...] it is also a positive factor that many energy-minded people already live there and that they can also get involved in future transformations. So, we have a lot, a relatively large number of skilled workers." (03/2024)

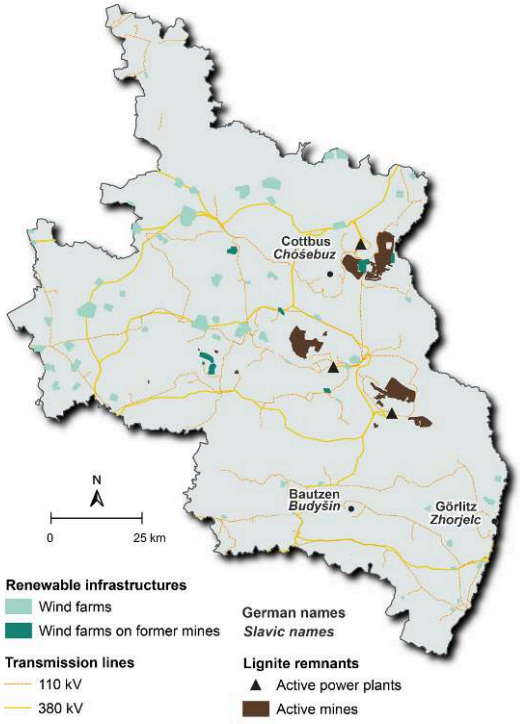
37 While the InvKG aims to enable a fundamental transformation of the Lusatian economy – after decades of decline - the development strategy outlined in the *Leitbild* remains deeply path-dependent. Especially, the path-reinforcing mechanism of complementarity is at play. Some historically rooted characteristics of Lusatia now appear as potential assets for the renewable energy transition. The region's existing grid infrastructure, extensive open spaces on former mining sites, and available skilled labour align well with the requirements for renewable energy infrastructure. For federal and regional policymakers, it makes practical sense to build upon these assets rather than to create new ones from scratch. Figures 5 and 6 show how the emerging renewable energy landscape overlaps spatially with the old lignite energy landscape. The lay-out of the electricity grid is thereby especially structuring the spatial pattern of large-scale windfarms.

Figure 5. Coal-based electricity system in Lusatia.



Source: authors based on data geoportal Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft, Energieportal Brandeburg and Open Street Map.

Figure 6. Current electricity system in Lusatia, combining old lignite and emerging renewable infrastructures.



Source: authors based on data from geoportal Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft, Energieportal Brandeburg, GeoMIS Sachsen and Open Street Map.

38 However, the decision to leverage existing assets for the renewable energy transition is not politically neutral. It inherently reinforces the position of incumbent actors. The lignite mines and lignite-fired power plants in Lusatia are owned and operated by Lausitz Energie AG (LEAG), currently holding the second largest share of electricity generation in Germany (Bundesnetzagentur & Bundeskartellamt, 2025). With its Gigawatt Factory plan, LEAG is reorienting its business towards renewables to maintain its market dominance in the post-coal era. Former mining areas are now being repurposed to host photovoltaic and wind installations, combined with large-scale storage and green hydrogen facilities, ensuring a stable supply of renewable electricity (LEAG, 2024).

39 The path-dependency in Lusatia's energy transition is also shaped by mechanisms of increasing returns and power. LEAG's portfolio of grid-connected lands has become a strategic asset, transforming sites once deemed "end-of-life" into profit generating hubs. Originally, these areas were legally required to be restored as artificial lakes or agriculture/forestry recultivations (§15(2) Bundesnaturschutzgesetz; §66 Bundesberggesetz). Now, LEAG can extract even greater profits from these lands than initially anticipated. Furthermore, access to already connected land gives LEAG a competitive edge over potential new market entrants, who must search for suitable sites and lobby for grid expansion. In that way, LEAG is poised to transfer its powerful position into the renewable energy future.

40 The combined path-reinforcing mechanisms guiding both *Leitbild* policymakers and LEAG contribute to the reproduction of a large-scale, centralised energy system. These

ongoing dynamics – policy and corporate-led alike - reinforce existing power structures and relations within the electricity sector and the wider German economy. This forms a sharp contrast with the original idea and practice of the *Energiewende* as a decentralisation and democratisation project empowering citizens to become co-owners of the energy system (Moss *et al*. 2015, Gailing & Röhring 2016). By taking advantage of path-dependency, large utilities can continue to dominate electricity generation in Lusatia, while citizens are relegated to the roles of passive consumers or, at best, subordinate employees. This is a missed opportunity to reimagine citizens as active co-owners of renewable assets and infrastructure. In the broader economic context, spatial hierarchies and inequalities remain intact. Lusatia continues to serve as an energy periphery, a resource frontier from which energy and financial capital are extracted for the benefit of an urban core. Most of the electricity generated by LEAG in Lusatia is transmitted to the rest of Germany, while the profits flow to multinational shareholders, currently the Czech investment holding EP Group and private equity fund PPF (Reuters, 2016).

41 Thus, the ongoing energy transition in Lusatia, while nominally about innovation and sustainability, perpetuates existing unequal socio-economic relations rooted in historical injustices – from the displacement of the Sorbs/Wends to mass layoffs following German reunification. In the next section, we further explain how acknowledging these historical injustices is essential for ensuring a truly just and sustainable energy transition.

No just energy transition in Lusatia without recognition

42 Contrary to previous rounds of political-economic restructuring in Lusatia, justice now appears to be a policy concern. Especially at the EU level, the "just transition" discourse seems omnipresent. The Just Transition Mechanism (JTM), with its own Just Transition Fund (JTF), forms an integral part of the European Green Deal package. This mechanism provides targeted support for *"the regions and sectors that are most affected by the transition because they depend on fossil fuels or carbon-intensive processes"* (European Commission, 2019, p. 16). With the tagline *"making sure no one is left behind",* the JTM signifies the Commission's aim to make the transition to a climate-neutral economy fair and inclusive (European Union, 2020; Sarkki *et al.*, 2022). Due to its lignite-based economy, Lusatia is a textbook example of a target region for the JTM. As a result, the federal funding through the InvKG is supplemented by EU funding from the JTF, giving regional and local authorities more leverage to realise the *Leitbild* (European Commission, 2022).

43 The interpretation of a just transition, as put forward by the European Commission in the JTM, centres on safe-guarding employment. The European Green Deal states that the JTM will "*strive to protect the citizens and workers most vulnerable to the transition, providing access to re-skilling programmes, jobs in new economic sectors, or energy-efficient housing*" (European Commission, 2019, p. 16). A just transition is thus understood as one where workers are supported to move from jobs in phased-out fossil industries to new, more climate-friendly sectors. Given the region's history of mass layoffs, it is not surprising that the discourse surrounding transition in Lusatia is dominated by the fear of unemployment (Forsa, 2013; Radtke & David, 2024).

44 However, the literature suggests that the (EU) attention for the loss of jobs is disproportionate (Haywood *et al.*, 2021; Schuster *et al.*, 2023). The political compromise surrounding the *Kohleausstiegsgesetz* included several measures that have made job loss a less pressing issue (Schuster *et al.*, 2023). First, workers will continue to be employed by the lignite mines for some time, as closures are only planned for 2038. The government also provides an adjustment stipend for those miners who take early retirement. For those still too young to retire, there are opportunities to work in lignite mining aftercare. Given the demographic profile of the mining workforce, the number of workers not covered by these arrangements will likely be limited (Haywood *et al.*, 2021).

45 Even more so, because of the demographic dynamics, Lusatia is already losing skilled workers. Realising the desired structural transformation of the regional economy will therefore require attracting a significant number of new workers. To this end, the *Leitbild* also aims to make Lusatia a more attractive place to live, hoping to encourage more families to settle there. This strategy of building a regional energy economy partly reliant on immigrant labour echoes processes dating back to the 19th century industrialisation of Lusatia. It illustrates how the region continues to be imagined as a resource periphery and struggles to escape the underlying see-saw movement of uneven development. Decisions about the exploitation of Lusatia's resources, whether coal in the past or renewables today, are made by external actors, who bring in investments and labour as long as conditions are profitable, only to withdraw them when the conditions change. Resources and their profitability are what guides movement of capital in and out of resource peripheries (Hayter *et al.*, 2003). As a result, this movement unfolds with little regard for the social groups inhabiting the area: in Lusatia, this has been the case for the Sorbian/Wendish communities who were displaced when capital flowed in, and for lignite mining communities who were dismissed or left behind when capital flowed out. In that regard, injustice is not tied to the expansion or decline of mining activity per se, but is inherent to the political-economic organisation of the region as a resource periphery and to the associated place-bound vulnerabilities (O'Sullivan *et al.*, 2020).

46 While the current public investment packages are mobilised to go against the grain of market-driven uneven development through a discourse of 'leaving no one behind', they however seem to be adopting the same resource-oriented logic. Despite the discourse surrounding the Just Transition Fund (JTF) highlights vocational training and the creation of new jobs through the support of innovative small- and medium-sized enterprises (SMEs) (European Commission, 2022), we observe that the financial influx generated by the fund is partly captured by an incumbent multinational utility. In 2024, LEAG secured 103 million euros from the JTF to develop two hydrogen production and storage projects on its former lignite sites, as part of its broader Gigawatt Factory plan (Renewables Now, 2024). This represents 9% of the total JTF allocation in Lusatia, which comprises of 745 million euros in the region's Brandenburger part and 375 million in its Saxon part (European Commission, 2022; Europa fördert Sachsen, 2025a). In Brandenburg, LEAG is the second-largest beneficiary of the JTF, after a public infrastructural project introducing broadband internet (Land Brandenburg, 2025), while in Saxony LEAG is the largest beneficiary (Europa fördert Sachsen, 2025b). These developments show how path-dependent mechanisms, such as increasing returns on assets like land and infrastructure, and Lusatia's subordinate position as resource

periphery enable LEAG to reinforce its position of power. The share of this investment that eventually trickles down through wages will primarily benefit a newly attracted workforce rather than the ageing local population.

47 In other words, the EU's focus on employment as the central pillar of a just transition falls short in promoting true energy justice. The distribution of benefits is skewed towards incumbents and new incoming workers. Despite a certain political sensitivity to the collective trauma of past mass layoffs, the transition *Leitbild* fails to address the historical marginalisation processes of that have impacted local communities in the region, from Sorbs/Wends to lignite miners. While recognitional justice scholarship traditionally focuses on the specific cultural characteristics of particular communities to explain and critique marginalisation, our historical and spatial approach reveals that the marginalisation of different communities over time is tied to the persisting subordinate role of the region as a whole.

48 From the 19th century until the present, extractivism has been the dominant development model in Lusatia. The region's lignite resources have been appropriated and commodified mainly to serve the interests of external actors. Lusatia has thus functioned as an energy resource periphery, performing the "dirty work" that ensures the energy supply and capital accumulation for the urban core. To fulfil this role, the territory has been fundamentally reshaped: roughly 90,000 hectares, or *ca.* 8% of the region's area, have been mined at some point (Statistik der Kohlewirtschaft e.V., 2025c). Additionally, a dense network of railroads and power lines was established to facilitate the export of lignite-based commodities, including electricity (see Figures 2 and 5). This persisting subordinate role as energy periphery has not only resulted in the physical alteration of the landscape but also in multiple rounds of social reorganisation of the territory. In our analysis, we highlighted the injustices associated with these reorganisations, such as the eviction of (Sorbian/Wendish) settlements during the industrial boom and the mass layoffs of lignite miners following the privatisation after German reunification.

49 In short, the socio-environmental burdens of this extractivism have fallen on Lusatia and its inhabitants, while its benefits serve core regions and companies in Germany and beyond. The ongoing renewable energy transition remains shaped by path-dependencies geared towards extractivism. As a result, the transition risks reproducing Lusatia's subordinate position as a resource periphery, where it must continue to bear the burdens while accrue benefits elsewhere. To truly address the systemic injustices rooted in the peripheralization of Lusatia, simply substituting lignite with renewable energy will not be enough. Instead, an alternative development model must be established: one that creates and retains value –financial, but also social and environmental locally. A key component of this effort would be to address the highly concentrated ownership of land that resulted from the privatisation after German reunification. Land ownership lies at the heart of balancing renewable energy development with the need for natural or cultural restoration to heal socio-environmental damage. Thus, what started as an inquiry into just transition and energy justice in Lusatia ultimately leads to the broader issue of environmental justice.

Conclusion

50 This paper has explored the energy transition as a deeply geographical and historically embedded process, using the case of Lusatia to illustrate how past and present patterns of uneven development shape the prospects for a just transition. Moving beyond techno-economic approaches, we have shown that achieving energy justice requires careful attention to the spatial and temporal dimensions of change, particularly in energy-producing regions like Lusatia that have long been shaped by fossil fuel dependency and peripheralization.

51 The analysis of Lusatia's transformation from an industrial hub to a marginalised region reveals deep-rooted energy injustices, particularly affecting the Sorbian/Wendish community through displacement, cultural erosion, and ongoing socio-economic exclusion. The renewable energy transition in Lusatia, driven by EU and federal policies, is unfolding through a path-dependent process that builds on existing coal-era infrastructures and power structures. While policies like the *Kohleausstiegsgesetz* and *InvKG* aim to foster economic renewal, they largely reinforce incumbent interests—especially those of utility giant LEAG—ultimately reproducing a centralised energy system and sustaining long-standing regional inequalities. While the EU's Just Transition Mechanism brings attention and funding to Lusatia, its employment-focused approach risks reproducing historical injustices linked to extractivist activities by benefiting external actors and newcomers rather than local communities. To truly address Lusatia's long-standing marginalisation as an energy resource periphery, a deeper shift is needed, one that reclaims local value, tackles land ownership inequalities, and prioritises solidarity alongside environmental and social justice. These findings highlight that energy transitions are not merely technical or economic shifts but are deeply entangled with geography, history, and power.

52 This paper has contributed to the growing field of energy justice by emphasising its inherent spatial dimensions, using Lusatia as a focal point to explore how place-based dynamics shape environmental justice outcomes. Our analysis shows how Lusatia's continued positioning as a resource periphery makes the region more prone to sustained injustices. As O'Sullivan *et al.* (2020) showed for Wales in the UK, the same peripheries are exploited over and over again for different resources. While the energy transition represents a necessary and urgent societal project, it is playing out within the dominant frame of (neoliberal) capitalism. As a result, the transition risks repeating prior patterns of resource peripheralization, once again imposing the burdens of transition on already marginalised places. In this regard, caution is warranted for so-called 'left behind places' that hope to level up thanks to green technology development. Drawing on a case-study of an electric vehicle battery gigafactory in Thuringia, Eastern Germany, Langguth (2025) challenges the promise that green technology projects can drive the development of such places. He shows how peripheralization is not counteracted but rather reinforced through outward-oriented value flows, a failure to address local social-ecological needs and exacerbated power imbalances between the federal and local state levels. Similarly, our findings, indicate that the JTF prioritises externally oriented financial value creation over local socio-ecological needs.

53 In that way, our findings underscore that justice in energy transitions cannot be achieved through economic compensation or infrastructure investment alone. It

requires reimagining the processes and priorities of transition in ways that confront historical legacies and bring the voices of affected communities to the center. Recognising the spatial and temporal specificity of energy justice is key to ensuring that transitions do not simply reinforce peripheralization, but offer meaningful repair and transformation. By foregrounding Lusatia's complex trajectory, this paper contributes to a more grounded and critical understanding of energy justice, one that resists abstraction and instead pays close attention to place, power, and the politics of recognition.

54 While this study provides important insights into the place-based dynamics of energy transition in Lusatia, its exploratory nature also opens a range of new questions for future inquiry. Our historical analysis identified the Sorbian/Wendish community and lignite workers as key stakeholders who have borne the burdens stemming from Lusatia's role as a resource periphery. However, to truly recognise these often overlooked communities in line with the principle of recognitional justice, further research should delve deeper in their lived experiences, perceptions and unfulfilled needs, for example through a larger number of interviews and/or ethnographic methods. Bringing these often marginalised voices and experiences to the forefront could offer important entry points for understanding how diverse social, cultural, and historical perspectives shape local expectations for energy justice, and how these expectations can translate into socio-political stances and strategies. Such work would help illuminate the multiple and often competing meanings of justice in energy transitions, as well as the ways in which these meanings are negotiated in specific local contexts.

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ABSTRACTS

Growing concerns about climate change and geopolitical risks highlight the need to transition away from fossil fuels. Increasingly, scholars and policy-makers are becoming more attentive to justice concerns associated with such an energy transition. This paper seeks to contribute to the emerging body of scholarship that is "spatializing energy justice". To do so, it puts forward the case of the German lignite-mining region of Lusatia as an entry point to unravel the mutual relations between processes of uneven development, peripheralization and energy (in)justice. Our spatially and historically sensitive analysis reveals that issues of recognitional justice lie at the heart of transition concerns in Lusatia, cascading into challenges of distributional and procedural justice. These justice concerns are deeply intertwined with the spatial process of resource peripheralization. Without addressing the root of these systemic injustices, the current energy transition risks getting locked in path-dependencies, thereby reinforcing historical power structures and imposing the transition's burdens on already marginalised places and communities such as the Sorbs/Wends and labourers from the former German Democratic Republic. However, the current energy transition also presents an opportunity for Lusatia to reorient its development trajectory and address longstanding injustices. Achieving a just transition will require learning from past mistakes of non-recognition and misrecognition,

particularly those made during German reunification, and fostering collaboratively efforts towards meaningful repair.

Les inquiétudes croissantes liées au changement climatique et aux risques géopolitiques soulignent la nécessité de sortir des énergies fossiles. Les chercheurs et les décideurs politiques sont de plus en plus attentifs aux questions de justice liées à cette transition énergétique. Cet article vise à contribuer au débat scientifique émergent sur la « spatialisation de la justice énergétique ». À cette fin, il présente le cas de la région minière allemande de Lusace comme point de départ pour démêler les relations mutuelles entre les processus de développement inégal, de périphérisation et d'injustice énergétique. Notre analyse, qui tient compte des aspects spatiaux et historiques, révèle que les questions de justice reconnaissante sont au cœur des préoccupations liées à la transition en Lusace, entraînant des défis en matière de justice distributive et procédurale. Ces questions de justice sont profondément liées aux processus spatiaux de périphérisation des ressources. Si l'on ne traite pas la racine de ces injustices systémiques, la transition énergétique actuelle risque de se retrouver prisonnière de dépendances historiques, renforçant ainsi les structures de pouvoir et imposant le fardeau de la transition à des lieux et des communautés déjà marginalisés, tels que les Sorabes/Wendes et les ouvriers de l'ancienne République démocratique allemande. Cependant, la transition énergétique actuelle offre également à la Lusace l'occasion de réorienter son développement et de remédier à des injustices de longue date. Pour parvenir à une transition juste, il faudra tirer les leçons des erreurs passées en matière de non-reconnaissance et de reconnaissance, en particulier celles commises lors de la réunification allemande, et encourager les efforts collaboratifs en vue d'une réparation véritable.

INDEX

Keywords: energy justice, coal phase-out, resource periphery, uneven development, Germany, Lusatia
Mots-clés: justice énergétique, sortie du charbon, périphérie, développement inégal, Allemagne, Lusace

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