

From Regional Cohesion and Structural Policy to Just Transition and Transformative Change?

A growing Lack of Conceptual Clarity

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Abstract: *This chapter aims to clarify the conceptual and policy ambiguities that hamper governance of the green transition by disentangling four often conflated notions—structural change, transformative change, just transition, and transformative regional development—and showing how they interlock. Centering on Germany within the European Union's cohesion framework, it combines a historical-institutional account of regional structural policy, rooted in the Basic Law's mandate for equivalent living conditions, with a conceptual synthesis and a critical appraisal of ongoing reforms such as the 'greening' of the 'Joint Task for the Improvement of Regional Economic Structures' (GRW [Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur]) in Germany and the EU's pivot from ecological modernization towards green reindustrialization.*

A cascading logic is proposed: structural change reveals where regions stand; transformative change, where they must go; just transition, under what terms of fairness; and transformative regional development, how to deliver on the ground through mission-oriented coalitions. The chapter urges a shift in regional structural and Cohesion Policy from a compensatory, growth-led paradigm to a preventive, adaptive, and justice-by-design approach aligned with planetary boundaries and territorial specificity.

Two governance risks are highlighted—centralized fund management that weakens regional voice, and the concentration of flagship green investments in already advantaged regions widening spatial inequalities—and remedies proposed: binding carbon and justice conditionalities across funds, systemic capacity building, cross-fund coherence, and a revised indicator dashboard. The chapter concludes with a forward research agenda on evaluation, governance experimentation, and metrics, offering a roadmap to recast regional structural and Cohesion Policy as a driver of climate-neutral, socially equitable, and territorially sensitive transformation.

Keywords: *structural change; just transition; regional structural policy; cohesion policy; transformative regional development*

1 Introduction

The transition to a climate-neutral economy ('green transition') represents one of the most profound challenges of our time, demanding not only technological innovation but also far-reaching structural, societal, and territorial adjustments (Grillitsch et al., 2025; Tödtling et al., 2022). As discussions on directing this transformation intensify, a growing lack of conceptual clarity becomes evident, particularly regarding the relationships among structural change, transformative change, just transition, transformative regional development, and the role of structural policy. These terms, although partly used interchangeably in public and academic discourse, embody distinct logics, dynamics, interrelations, and policy implications.

Structural change is an inherent feature of economic development, reflecting the continuous adaptation of sectors, labor markets, and regional economies to technological progress, global competition, and societal preferences (Dahlbeck et al., 2022; van Neuss, 2019). However, this dynamic is not frictionless. External shocks, such as geopolitical conflicts or environmental disasters, as well as gradually unfolding changes, such as digitalization or demographic shifts, can cause disruptions that undermine economic resilience and social cohesion. In such cases, the state intervenes through structural policy, which comprises institutional and legal instruments to mitigate regional disparities and support lagging sectors. This policy domain is typically divided into sectoral and regional structural policy, with the latter gaining increased relevance in light of spatially uneven impacts of transformative change (Gärtner, 2019; Liargovas & Papageorgiou, 2024). This normative framework is grounded in Germany's constitution, which mandates equivalent living conditions nationwide. At the supranational level, the European Union pursues similar objectives under its Cohesion Policy (Li, 2025).

By contrast, *transformation* refers to a more fundamental, systemic change, often politically initiated and normatively driven (Letmathe et al., 2024; Loorbach, 2022). Transformative processes, such as the transition from a planned to a market economy in Eastern Germany or the commitments set by the Paris Agreement, entail not just adaptation but an intentional re-orientation of societal and economic systems. While structural change and transformation in-

tersect, conflating these concepts risks analytical imprecision and, more importantly, weakens governance capacity to address the root causes of climate change and its socio-economic implications.

Within this landscape, the concept of a *just transition* (McCauley & Heffron, 2018; Wang & Lo, 2021) has gained prominence, stressing the need to ensure that the burdens and benefits of ecological transformation are shared fairly across different social groups and territories. A just transition emphasizes social inclusion, equity, and participation, particularly for those communities, regions, employees, and other citizens most affected by decarbonization and structural change (Stark et al., 2023). Thus, justice concerns must be embedded not only in climate and energy policy but also in the design and implementation of structural policy itself. So doing necessitates a redefinition of policy goals, shifting from narrowly defined economic growth to broader indicators of well-being and sustainability. As one of the EU's main investment frameworks, *Cohesion Policy* aims to reduce disparities between regions, strengthen economic, social, and territorial cohesion, and increasingly support climate-related goals (Demeterova, 2024; European Commission, 2024). In this context, it serves as both a financial instrument and a governance tool, aligning regional development with the imperatives of a just and ecological transition.

This chapter argues that regional structural and Cohesion Policy stand at a critical juncture. First, ecological transformation will inevitably trigger new forms of structural change, necessitating policy responses that embed environmental goals within economic, social, and cultural frameworks. Second, structural policy itself must evolve, moving from a compensatory instrument that reacts to the side effects of transformation to a preventive, transformative, and justice-oriented tool aligned with sustainability and inclusion objectives. Third, as ecological transformation unfolds in territorially differentiated ways, regional structural policy becomes the pivotal arena for governance. Furthermore, the re-orientation of instruments, such as Germany's 'Joint Task for the Improvement of Regional Economic Structures' (GRW [Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur]), already signals a soft shift toward a structurally embedded ecological logic. Fourth, the reform of the EU Cohesion Policy is currently being debated, with the emphasis on directing resources towards strategic priorities such as climate action, digitalization, and social cohesion (Filippetti & Spallone, 2025). Although the bulk of the funding will likely be channeled through Member States rather than allocated directly to regions, this centralized approach—intended to enhance oversight and administrative efficiency—has prompted concerns that specific regional needs

may be overlooked (Fratesi, 2025; Rodríguez-Pose, 2025). Against this backdrop, the analysis is guided by two research questions:

How can a policy instrument originally designed to offset the side effects of market-driven structural change be repurposed to steer a deliberately accelerated, socially fair, and territorially differentiated climate transition?

How can clarifying the concepts of structural change, transformative change, just transition, and transformative regional development help re-orient Germany's regional structural policy—within the EU cohesion framework—from a compensatory, growth-led tool to a preventive, place-based, and justice-oriented driver of climate-neutral, socially equitable transformation?

This chapter explores these questions by tracing the conceptual evolution, policy realignments, and spatial implications of transformative regional structural policy in the context of ecological transformation and the emerging just transition agenda. Although the focus is on Germany's structural and regional policies, the discussion is embedded within the EU's Cohesion Policy framework and informed by the wider international academic debate on regional transformation.

Section 2 charts the historical evolution of Germany's regional structural policy, situating it within both the constitutional mandate for equivalent living conditions and the broader trajectory of EU Cohesion Policy. Section 3 disentangles the four key concepts at the heart of the debate—structural change, transformative change, just transition, and transformative regional development—pinpointing their respective logics, temporalities, and justice dimensions. Section 4 combines the critical appraisal of current policy realignments with the synthesis of principal tensions and the derivation of operational lessons: it contrasts the EU's shift from ecological modernization to green reindustrialization with Germany's 'greening' of the GRW. It assesses the attendant risks and opportunities for spatial justice, and distills implications for policymakers while laying out a forward-looking research agenda.

2 Structural Change: Dynamics and Policy Legacies

Before we can assess what a preventive, justice-oriented structural policy might look like, we must first understand how structural change has been conceived and governed to date. Accordingly, this section re-examines the

economic dynamics of structural change. It traces the policy legacies, constitutional, national, multilevel, and European, that have emerged to manage its consequences in Germany. By clarifying this historical and governance context, the analysis highlights the path dependencies and conceptual blind spots that any future, climate-compatible and socially equitable reframing of regional structural policy will have to confront.

2.1 Conceptual and Constitutional Foundations

Economic structural change is generally understood as a change in the structural composition of an aggregate value, such as gross domestic product (GDP) or the workforce (van Neuss, 2019). From a sectoral perspective, it encompasses changes in the structure of economic sectors, while from a regional perspective, it refers to shifts between individual regions. In Germany, securing equivalent living conditions in the federal territory is enshrined in the constitution, making it a legal requirement. Article 72(2) of the Basic Law formulates a statement on spatial equilibrium, thereby conferring on the federal level the authority to act or legislate

“[...] if and to the extent that the establishment of equivalent living conditions throughout the federal territory or the preservation of legal or economic unity in the national interest requires regulation by the federal law.”

Article 106 of the Basic Law, which determines financial equalization among the federal states in the event of imbalanced development, also affects regions. Germany's Regional Planning Act also takes a position in Section 1(2) by requiring the establishment of “*similar standards of living in all regions*”.

Historically, regional structural policy has sought to foster balanced territorial development, driven either by socio-political considerations or economic growth objectives. Accordingly, the rationale for such a policy can be articulated on both economic and socio-political grounds. From a socio-political standpoint, regional policy seeks to guarantee citizens across Germany equivalent living conditions. When the emphasis shifts to economic growth, however, the principal question becomes where interventions will yield the highest aggregate returns. Neoclassical theory predicts that regional disparities will decline endogenously: capital and labor migrate towards lagging areas, where diminishing marginal productivity ensures relatively higher growth rates (Fingleton & Fischer, 2010). Public investment in these struc-

turally weak regions is therefore expected to generate the greatest economy-wide benefits, as it accelerates the natural convergence process (Frey & Zimmermann, 2005; Gärtner, 2019). In this sense, a spatially equalizing structural policy is also growth-oriented, because the full utilization of resources in all territories maximizes national output.

A key pillar of Germany's regional structural policy is the GRW. Established in 1969, the GRW was conceived to harmonize and coordinate structural policy interventions across national (Bund) and state (Länder) levels of government. Instrumentally, the GRW works with incentives to direct investments into specific areas (Dettmann et al., 2025). Until the end of 2022, only structural projects were funded within the framework of the GRW that involved so-called 'distance selling', meaning they brought export income into the region (Alcaide Manthey, 2025). However, since January 1, 2023, the GRW has undergone reform, demonstrating its adaptability, and has notably incorporated many long-standing criticisms raised by regional and spatial sciences, showing its responsiveness to feedback (Suedekum, 2023). Thus, independent regional development and regional value creation are now being promoted more strongly.

Nevertheless, regional structural policy has yet to converge on approaches that prioritize quality of life and the strengthening of civil society, even though such orientations are demonstrably better suited to structurally weaker, peripheral regions. Instead, there has been a long-standing debate over the optimal degree of spatial concentration of investments in regions with growth potential (Wardenburg & Brenner, 2020). Proponents of this approach contend that weak and peripheral regions will eventually benefit from a growth-pole- or metropolis-oriented policy through spatial spillover and trickle-down effects; however, the empirical basis for this claim remains contested. Conversely, far less attention is paid to policy options for regions that lack growth potential (MacKinnon et al., 2022; Pike et al., 2024).

Implementing an unconstrained growth-pole strategy while simultaneously restricting development options elsewhere is unlikely to be efficacious, particularly in a highly decentralized country such as Germany. Such an approach risks cumulative advantages that widen spatial disparities, leaving unsupported regions increasingly marginalized and imposing welfare costs on society as a whole (Alcaide Manthey, 2025). A further, often overlooked, consequence is that peripheral areas with comparatively strong infrastructures, especially in the education sector, cultivate human capital that subsequently

migrates to the growth centers, thereby reinforcing the very inequalities regional policy seeks to mitigate.

2.2 From Peripheral Regions to Old Industrial Agglomerations

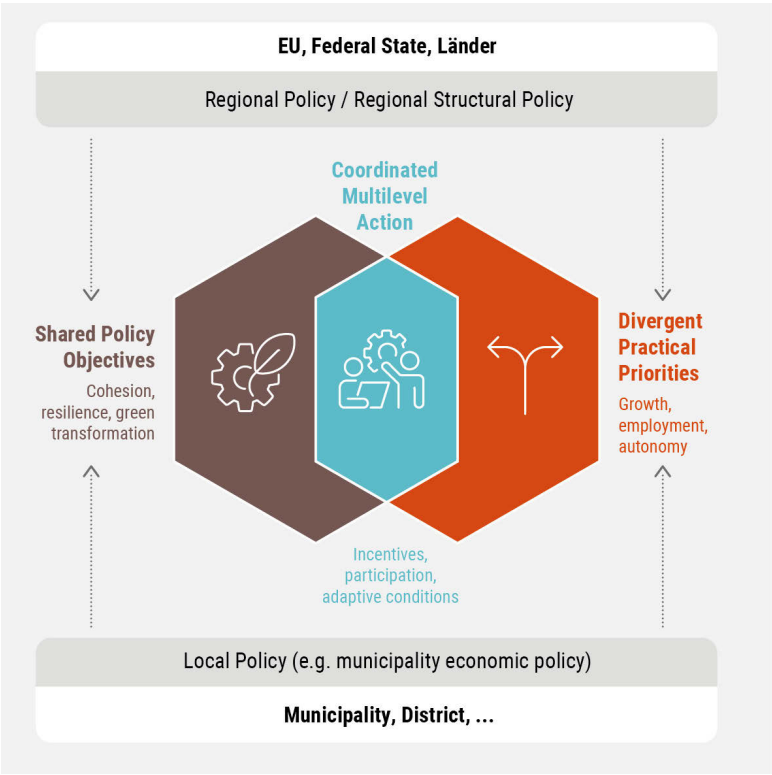
Regional structural policy traditionally focused on the urban-rural divide, a goal deemed essential for both economic growth and social equality. However, the catching-up paradigm, which presumes that development deficits are confined to peripheral regions, no longer holds. Similar shortcomings are now evident in several urban agglomerations, particularly in the former West German federal states (Flögel & Gärtner, 2019). The structural development of old industrial agglomerations was therefore traditionally not the focus of regional structural policy.

Traditionally, regional structural policy was introduced to support rural, agricultural, and remote areas. The decline of the coal industry since the 1960s was the first time that an industrial agglomeration was affected by economic weakness. In the Ruhr region, for example, the contraction of employment in hard coal mining was managed in a socially responsible manner, primarily through early retirement schemes, thereby largely preserving regional social stability. For the affected miners, early retirement entailed only minimal income losses. The gradual, heavily subsidized phase-out of hard coal therefore averted major 'structural upheaval'.

However, inevitable trade-offs arise when a dominant industry, and by extension, the region whose economy it underpins, begins to decline. In such circumstances, regional policymakers often prioritize regional development through instruments such as subsidies for firms and compensation payments to workers (OECD, 2023). It is, above all, about preserving the interests of shareholders and employees in the predominant industries, because established sectors typically provide relatively high wages and attractive returns. This understanding is to be seen in the context of regional structural policy operating within a multilevel governance framework that extends from the EU, federal, and state levels down to the municipal tier (Benz, 2021). In Germany, access to lower spatial levels (e.g., federal states or municipalities) is limited by the constitutionally guaranteed local self-government. This issue has become particularly evident in Germany's 'Energiewende' (energy transition), notably in the efforts to install new high-voltage transmission lines to convey wind-generated electricity from the north to the south. For large-scale

infrastructure projects of this kind, it is therefore essential to secure the active participation of the diverse stakeholders within the affected regions.

Figure 1: Levels of Regional Structural Policy



Source: Own compilation

Local economic policy—a policy that focuses on the city, county, or region—is pursued independently of the structural policy objectives of higher governance levels, as illustrated in Figure 1. Often, the aims of the different tiers complement one another; for example, structurally weak regions may draw on targeted EU or federal state programs to support balanced regional development. The distinction between regional and local economic policy, however, is far from trivial, as municipal economic initiatives can pursue

egocentric goals irrespective of broader regional objectives. Thus, alongside consensus-oriented strategies, conflictual local economic policies may arise, creating situations in which not everyone benefits, for example, when many regions court the same sectors, which increases the competition. Even ostensibly balance-oriented regional strategies can inadvertently exacerbate disparities if already prosperous regions leverage ‘smart’ economic policies to capture a disproportionate share of the resulting benefits, thereby widening the regional welfare gap.

2.3 EU Regional and Cohesion Policy

The EU’s regional and Cohesion Policy aims to reduce economic and social disparities between territories and to promote balanced development across all areas (Medeiros et al., 2024; Rodríguez-Pose, 2025). In practice, this is achieved through the provision of financial resources, for example, via the European Structural Funds (e.g., the European Regional Development Fund) and the Cohesion Fund, as well as the new Just Transition Fund, which is invested in projects at the regional or national level.

In the forthcoming programming periods, EU policy must continue to reconcile a persistent dual tension: on the one hand, it seeks to uphold a liberal economic order and an efficient, competitive single market; on the other hand, it is obliged to reduce economic, social and territorial disparities among Member States and regions—a commitment set out in Article 174 TFEU and reinforced by Article 175, which places a corresponding duty on the Member States (Cappellano et al., 2024; European Commission, 2024; Li, 2025).

Already in the 2000s, the Lisbon Strategy led to a more economically oriented approach to regional policy: funding was increasingly concentrated on growth poles, while the needs of less developed regions were considered only to a limited extent (Bachtler & McMaster, 2007; Bruijn & Lagendijk, 2005; Farole et al., 2011). The Europe 2020 strategy incorporated social and environmental goals without compromising the focus on growth. In the current funding period (2021–2027), in addition to traditional cohesion objectives, digitalization, the green transition, and crisis resilience are central priorities. Funding allocation is increasingly linked to strategic investment and reform objectives, with regional needs still taken into account, although often secondary to growth- and innovation-oriented criteria.

From 2028, a comprehensive reform of the funding architecture is planned: regional and agricultural funds could be merged into a single fund,

from which resources will be disbursed to Member States—rather than directly to regions—once they submit investment and reform plans in line with the political requirements of the European Commission (Filipetti & Spallone, 2025; Rodríguez-Pose, 2025). This reform will tie funding more closely to national strategies, following a model similar to the NextGenerationEU Fund.

Schwab & Resende Carvalho (2023) point out that the digital and green transitions may further widen the gap between economically strong and weak regions in Europe. Regions with high innovation capacity, well-educated workforces, and modern infrastructure—typically urban centers such as Stuttgart or Upper Bavaria—are likely to benefit from digitalization and the green transition, enhancing their growth potential. Weaker regions, particularly rural areas or those with carbon-intensive industries, face significant adjustment costs, for instance, due to necessary investments in climate-friendly technologies or the thermal renovation of buildings.

If implemented as planned, the funding period from 2028 onwards will be characterized by a stronger linkage between national reform plans and strategic investments, leading to a nationalization of EU regional policy, as resources will primarily be managed through the Member States.

2.4 From Reactive to Anticipatory Structural Policy

Debates on precautionary, rather than merely reactive, structural policy date back to the 1970s (Rembser 1977). Trade-union proposals in the early 1980s called for the promotion of science and technology to be linked to regional aid and for crises to be pre-empted rather than compensated *ex post* (Bömer & Noisser, 1981; Pfeiffer, 1982). The trade union concept envisaged an anticipatory “structural policy that does not attempt to correct sectoral or regional mis-developments retrospectively but intends to avoid them from the outset” (Pfeiffer, 1982, 623).

In their study “Information Bases for Anticipatory Structural Policy”, Thoss and Ritzmann (1984) sought to advance qualitative growth, fully utilize existing production factors, and secure a balanced relationship between supply and demand at the regional scale. Their proposal entailed the proactive promotion of expanding sectors, accompanied by an early and orderly withdrawal from those in decline. Crucially, they argued that such an anticipatory approach creates an extensive demand for information, necessitating detailed analyses, forecasts, and projections (Thoss & Ritzmann, 1984).

These proposals were never implemented, primarily because of the inherent difficulties in reliable forecasting. Furthermore, the recommendations remained mainly at the level of conceptual exhortation. While they highlighted the need for a stronger regional focus, this was articulated only implicitly and from an essentially macroeconomic perspective.

Subsequent historical events (like the fall of the Berlin Wall and the reunification, or the Tequila and Asian financial crises) further undermined the feasibility of long-range anticipatory policy as they demonstrated how swiftly macroeconomic and geopolitical shocks, alongside global crises, can overturn existing trajectories, necessitating ad hoc measures that leave little room for long-term planning. In the context of political transformations in Eastern Europe and Russia, and amid the ascendancy of a global market-oriented order, policymakers were also reluctant to embrace frameworks perceived as overly directive or reminiscent of central planning.

Moreover, structural policy has traditionally been justified on the basis of a regional status quo in which structurally weak regions are primarily supported (Alcaide Manthey, 2025; Weingarten, 2010). A preventive approach, however, would require policymakers to finance structural change even in regions that are currently structurally strong. Structural weakness would arise only if earlier preventive measures had failed ('the prevention paradox'). Consequently, when preventive structural policy coincides with gradual or 'silent' structural change, the political dividends are inherently limited. Preventive structural policy also poses a challenge for spatial planning, as economically obsolete land uses often persist, thereby constraining regional capacity for new development. This problem is particularly evident in regions of the automotive industry that remain prosperous, such as the Stuttgart region (Hemberger & Kiwitt, 2020). Given ecological imperatives that call for the prudent use of land resources, suitable sites for emerging sectors are scarce.

Preventive structural policy often fails because it is impossible to predict with confidence which sectors will prove competitive in the future. Nevertheless, the imperative to mitigate climate change will inevitably drive substantial economic restructuring. Beyond the intrinsic value of ecological transition for economic transformation, fostering so-called 'green' industries is expected to generate enduring, sustainable economic structures. Preventive intervention, therefore, possesses intrinsic ecological value, as it prompts early trajectory shifts and avoids unnecessary resource consumption.

The considerable challenge of identifying, at a sufficiently fine-grained level, which regions ought to be prioritized for support in the context of eco-

logical transformation, and of calibrating funding instruments accordingly, is largely undisputed (Rodríguez-Pose, 2025; Südekum & Rademacher, 2024). Trade unions have grappled with this problem since the 1980s and continue to engage with it today. Within the German Trade Union Confederation's 'Revierwende' initiative, financed through the Coal Regions Structural Strengthening Act, union representatives emphasize that EU state-aid regulations restrict direct corporate subsidies to disadvantaged regions, thereby limiting the scope for proactive, anticipatory intervention in ostensibly stronger territories.

Having traced past attempts at anticipatory policy, we now turn to the new strategic pressures that will shape regional policy in the second half of the 2020s.

2.5 Current Policy Pressures and Emerging Fault Lines

Both Germany's regional-structural policy and the EU's cohesion architecture were designed in an era when accelerated growth and inter-regional convergence were assumed to be mutually reinforcing.

Recent strategy documents at the EU and federal levels imply a trajectory from ecological modernization—retrofitting existing industries with cleaner technologies—towards green reindustrialization, which seeks to establish entirely new value chains in renewable energy, hydrogen, battery production, and the circular economy. Reindustrialization is cast simultaneously as a decarbonization pathway and as a lever for restoring strategic autonomy in the wake of geo-economic disruptions. As a result, spatial targeting is becoming more differentiated: coal regions receive transition aid, while advanced manufacturing hubs compete for 'green-lead' projects. Yet, this putative dual solution risks reproducing established core–periphery dynamics if flagship projects become concentrated in already advantaged regions. Coal-dependent areas may receive transition aid, whereas advanced manufacturing hubs are likely to capture the lion's share of research funding, skilled labor, and venture capital, thereby potentially exacerbating spatial inequalities beneath a "green" veneer.

Although the exact design of EU regional policy for the 2027+ funding period remains uncertain and is unlikely to be implemented precisely as currently envisioned, preliminary drafts of the Multiannual Financial Framework suggest that funding for regional development and Cohesion Policy will shrink (see Section 2.3). Because the strong regionalization of EU funds is largely a German peculiarity, a partial renationalization of program management is

anticipated, potentially reducing the Länder's influence. This prospect appears counter-productive to the long-standing ideal of a 'Europe of the Regions', especially given the consensus-oriented governance structures many German states have built around Cohesion Policy. As Rodríguez-Pose (2025, 1) warns, "Cohesion Policy [is] at its defining moment". Such recentralization would replace the policy's place-based partnership tenet with a compliance-and-control logic, further eroding regional voice and risking a loss of public trust in the EU—precisely the pattern already observed with National Recovery and Resilience Plans.

Even so, a more centralized framework could create new opportunities: bypassing Länder might allow local authorities to access funds directly for clearly defined objectives. Such a re-orientation could enable the federal government to strengthen equalization principles or to enhance local implementation capacity for the green transition as a routine responsibility, rather than through transient project funding. Moreover, in selected policy areas—particularly those linked to 'green transition'—the Commission could disburse funds directly to regions below federal states, subject to strict criteria such as demonstrable reductions in consumption-based CO₂-equivalent emissions.

3 Transformation, Transformative Change and Just Transition: Linking Social Justice and Ecological Goals

Building on the preceding discussion of structural change, the literature on sustainability transitions can be organized into four interconnected theoretical discourses: structural change (SC), transformative change (TC), the just transition (JT), and transformative regional development (TRD). Each layer answers a different analytical question—where we stand, where we need to go, under what terms of justice, and how to deliver in place—and must therefore be examined both separately and in concert.

3.1 Structural vs Transformative Change

While both structural change and transformative change have in common that they are umbrella terms whose meaning varies by discipline, historical period, and policy area, transformative change denotes a more profound, value-laden, and purposive re-ordering of socio-technical and socio-ecologi-

cal systems (Loorbach, 2022; Schot & Steinmueller, 2018; Scoones et al., 2020). Structural change is typically viewed as being incremental, adaptive, and mainly intentional. In contrast, transformative change is systemic, normative, and deliberate, setting out to reconfigure not only production structures but also the institutional logics, cultural norms, and power relations that underpin them.

While such a heuristic helps highlight why conventional structural policies may fall short in the face of the climate emergency, it should be treated as an ideal type rather than a ‘hard’ dichotomy. Episodes of structural change can be both rapid and state-orchestrated—as evidenced by China’s post-1978 sectoral re-allocation (Brandt & Rawski, 2022) or the accelerated contraction of coal and steel industries that continues to shape ‘left-behind’ areas of the United Kingdom (Kaizuka, 2024; While & Eadson, 2022). Building on these observations, contemporary transition theory frames change processes as a continuum in which incremental and radical dynamics co-evolve and may even trigger one another (Geels, 2018; Grillitsch & Sotarauta, 2020). Acknowledging this ambiguity guards against overly rigid policy prescriptions and better captures the diverse pathways through which socio-ecological transitions unfold in practice.

Transformative change is further complicated by three interacting forms of complexity (Letmathe et al., 2024). *System complexity* emerges from the tight coupling of technological, economic, ecological, and social subsystems, whose staggered and opaque causal pathways impede the timely identification of harmful trends. *Backward complexity* reflects path dependencies created by sunk investments, institutional routines, and entrenched cultural norms; these inflate the costs of deviation from established trajectories and demand convincingly articulated alternatives, inclusive stakeholder engagement, and, where appropriate, compensatory mechanisms. *Forward complexity*, finally, refers to outcome uncertainty: because the ultimate efficacy and side effects of interventions can seldom be forecast with precision, opponents may mobilize this indeterminacy to contest transformative action, thereby reinforcing existing lock-ins and underscoring the need for continual pathway analysis, adaptive governance, and reflexive control instruments (Geels & Turnheim, 2022; Huntjens & Kemp, 2022). Recognizing these complexities helps justify adaptive and reflexive forms of governance.

3.2 Just Transition Lens

Against this backdrop, the notion of a just transition adds a justice lens to the debate on transformation. First articulated in late-1970s North American labor-union circles, most notably by the Oil, Chemical and Atomic Workers Union, and subsequently broadened by environmental-justice movements, the idea of a ‘just transition’ has since been taken up by global institutions (Cigna et al., 2023). It is embedded in the ILO’s 2015 Guidelines, referenced in the Paris Agreement and successive COP decisions (e.g., the 2018 Silesia Declaration and the 2021 Glasgow Climate Pact), and operationalized in policy frameworks such as the EU Green Deal and its Just Transition Mechanism (McCauley & Heffron, 2018; Wang & Lo, 2021). It posits that decarbonization should be evaluated not only by tons of CO₂ reduction but also by how fairly equitably costs and benefits are distributed, how inclusive decision-making processes are, and whose identities and capabilities are recognized. Equally important is how affected groups perceive this fairness; subjective judgements of (in)justice often condition public acceptance and the political durability of transition measures (Sovacool et al., 2025).

Investigated from diverse disciplinary perspectives—e.g., climate science, human and economic geography, sociology, energy economics, social policy, ethics, and law—the notion of a ‘just transition’ has yet to coalesce into a single, universally accepted definition. Although interpreted in multiple ways, the concept of a just transition unequivocally refers to a complex, multifaceted process that integrates climate, environmental, and energy objectives with the restorative, distributive, procedural, and intergenerational dimensions of justice (Galanis et al., 2025; McCauley & Heffron, 2018).

The term ‘just’ in just transition draws on classical theories of social justice articulated by philosophers such as Locke, Rousseau, Kant, and, more recently, Rawls (1971). It denotes fairness in both the distribution of benefits and burdens and in the procedures by which decisions are made (Moodie, 2025). Building on this foundation, climate justice further refines the notion of justice by stressing historical responsibility for greenhouse gas emissions, inter- and intra-generational equity, and the differentiated capacities of societies to mitigate and adapt to climate change (Newell et al., 2021; Porter et al., 2020; Rice et al., 2023). Accordingly, and distinct from ‘transition’, just transition processes require multiple actors and communities to actively engage in pursuing purposive change, aiming for a “better future for individuals, communities and

the environment” (Kaizuka, 2024, 156). Avelino et al. (2024, 520) encapsulate this philosophy, defining transformative change as processes

“[...] that aim to enable present and future generations, both human and nonhuman, to survive and flourish and eliminate and prevent injustices that are produced and exacerbated by unsustainability and its underlying causes.”

It follows that justice concerns inevitably have a spatial dimension, as the burdens and opportunities of decarbonization are unevenly distributed across space (Binz et al., 2025; Jenkins et al., 2018; Moodie et al., 2021). Coal-dependent regions, peri-urban logistics belts facing land-use conflicts, and emerging green-tech clusters all experience the transition in markedly different ways (Coenen et al., 2024; Kaizuka, 2024; Oei et al., 2020). Crucially, the sense of place attached to these territories’ shapes how citizens and other stakeholders experience change, ascribe meaning to it, and act in response, thereby influencing which transition pathways gain or lose legitimacy. If left unaddressed, such asymmetries risk widening existing spatial inequalities; if addressed proactively, they could open a window for place-based strategies that fuse ecological ambition with social inclusion, thereby creating ‘new’ opportunities (Barca et al., 2012; Rodríguez-Pose & Bartalucci, 2024; Weck et al., 2022).

This perspective positions regional structural, cohesion, and innovation policy as pivotal governance arenas (Li, 2025; Tödtling et al., 2022; Trippl & Tödtling, 2025). The task is to transition from an essentially compensatory logic of repairing ex-post damage to a forward-looking, preventive, and reflexive mode that aligns with planetary boundaries and justice principles. Here, the notion of socio-ecological transition comes into play (Sabato & Mandelli, 2024).

3.3 Transformative Regional Development

Transformative regional development (TRD) constitutes the fourth theoretical discourse. Whereas transformative change articulates *why* systems must change, TRD specifies *how* this change can be enacted within distinct regional contexts (Chlebna et al., 2023; Terstriep & Angstmann, 2025). Ideally, it translates high-level sustainability and justice missions into place-based strategies that mobilize local assets, address regional lock-ins and open new develop-

ment paths (Grillitsch & Sotarauta, 2020; Tödtling et al., 2022). TRD is therefore neither a mere subset of regional policy nor a straightforward extension of innovation policy; rather, it is a hybrid paradigm that draws concurrently on (i) evolutionary economic geography, particularly concepts of path creation and related variety (Grashof & Basilico, 2025; Karlsen et al., 2025); (ii) socio-technical transition studies and their emphasis on multilevel dynamics and niche–regime interactions (Bos-de Vos et al., 2025; Geels, 2024); (iii) and on the place-based development scholarship around smart specialization and entrepreneurial discovery (Kruse, 2025; Moraes et al., 2025; Schaltegger et al., 2023). Three features set TRD apart from the preceding discourses:

It elevates the *region*—rather than a sector, technology, or nation-state—to the focal unit of transformation. Acknowledging the context-sensitivity of TRD, enduring industrial legacies, institutional thickness, landscape values, and social capital are viewed not as passive backdrops but as levers or constraints that shape feasible decarbonization trajectories (Binz et al., 2025; Binz et al., 2020). Consequently, identical national climate targets can yield divergent regional pathways, from green reindustrialization in former coalfields to bio-circular diversification in peripheral forest regions.

It relies on *multi-actor mission-oriented governance*. TRD relies on the orchestration of regionally embedded coalitions that span firms, universities, public authorities, trade unions, and civil society organizations (Chlebna & Suitner, 2025; Rabadjieva & Terstriep, 2021; Terstriep & Angstmann, 2025). Mission-oriented portfolios, which combine research funding, skills programs, procurement, land-use regulation, and societal innovation measures, are deployed to align entrepreneurial discovery processes with sustainability and justice goals (Mazzucato, 2018; OECD, 2024; Uyarra et al., 2025). These portfolios must remain adaptive, incorporating iterative monitoring and reflexive learning to cope with forward complexity and outcome uncertainty.

Territorial ‘Just Transition Plans’ under the EU’s Just Transition Fund, or the ecological re-orientation of Germany’s GRW, exemplify attempts to fuse decarbonization with inclusive labor-market upgrading and community participation. Success can therefore be judged not only by carbon metrics but also by indicators such as quality employment, reductions in energy poverty, ecosystem regeneration, and improvements in subjective well-being. TRD therefore requires adaptive, reflexive governance architectures with built-in monitoring and course-correction mechanisms.

Forasmuch, far from being an optional add-on, TRD can be the locus where abstract sustainability ambitions confront the realities of uneven de-

velopment—where the promise of a truly just transition will ultimately be realized or forfeited.

3.4 Interrelatedness of Theoretical Discourses

Structural change (SC) discourse provides the analytical point of departure, explicating how economic activities relocate across sectors, technologies, and territories in response to long-term trends and sudden shocks (Dahlbeck et al., 2022; van Neuss, 2019). Transformative change (TC) adds a normative vector by specifying why a deep re-ordering of socio-technical and socio-ecological systems is required to keep development within planetary boundaries while enhancing social equity, as set out in the 2030 Agenda and the SDGs (Loorbach, 2022; Schot & Steinmueller, 2018; Scoones et al., 2020). The just-transition lens (JT) further sharpens this orientation, interrogating the conditions of fairness under which re-ordering should proceed—how costs and benefits are shared, whose voices count, and how historically marginalized groups and places are recognized (McCauley & Heffron, 2018; Wang & Lo, 2021). Finally, transformative regional development (TRD) operationalizes these imperatives in place, mobilizing regional assets, confronting locally embedded lock-ins, and crafting context-specific pathways to low-carbon prosperity (Grillitsch & Sotarauta, 2020; Tödtling et al., 2022). In shorthand: SC tells us where we stand; TC where we must go; JT under what terms of justice; and TRD how to get there in concrete territories.

Working together, the discourses form a cascading logic. SC diagnostics expose the sectoral structures, institutional routines, and social vulnerabilities that any transition strategy must address. TC defines directional targets—net-zero, circularity, inclusive prosperity—while JT embeds distributional and procedural guardrails. TRD then ‘anchors’ the composite agenda through smart specialization strategies, territorial just transition plans, and mission-oriented portfolios; successful regional experiments can be fed back to refine national or EU-level TC and JT discourses, creating an iterative learning loop across scales (Geels, 2018).

Because the geography of burdens and opportunities is uneven, JT concerns crystallize most sharply within TRD. Coalfields in Saxony, petro-chemical corridors in Zeeland, or peri-urban logistics belts around Milan face very different transition risks and potentials; without territorially sensitive justice safeguards, such asymmetries risk widening existing spatial inequalities (While & Eadson, 2022). Conversely, where TRD integrates JT principles from

the outset, decarbonization can become a vehicle for social inclusion and regional renewal.

The integration of SC, TC, JT, and TRD is complicated by three interacting forms of complexity (Letmathe et al., 2024). *System complexity* stems from tightly coupled technological, economic, ecological, and social subsystems whose opaque, staggered causal chains hinder timely intervention. *Backward complexity* arises from sunk investments, institutional routines, and cultural norms that lock places into carbon-intensive paths; overcoming it demands credible alternatives, broad participation, and, where appropriate, compensation. *Forward complexity* reflects outcome uncertainty: the side effects of interventions are challenging to foresee, inviting contestation and reinforcing lock-ins.

Table 1 contrasts the four discourses, disentangling the justice lens (a normative benchmark) from TRD (the territorial delivery vehicle) and mapping their complementary contributions to a sustainability transition.

Table 1: From Structural Change to Transformative Regional Development – Distinguishing Features

Dimen- sion	Struc- tural change	Transfor- mative change	Just transition	Transformative regional development
Onto- logical focus	Re-allo- cation within existing architec- ture	Re-configu- ration of the architecture itself	Re-configu- ration plus explicit re- distribution of burdens & benefits	Region as locus of change; creation of new place-based development paths
Nor- mative orienta- tion	Descrip- tive	Systemic & value-laden	Justice- centred (dis- tributional, procedural, recogni- tional)	Place-based sus- tainability missions integrating justice goals

Dimen- sion	Struc- tural change	Transfor- mative change	Just transition	Transformative regional development
Depth & pace	Often gradual, path-de- pendent	Deep & time- critical	Deep & rapid but paced to protect vul- nerable groups	Deep but calibrated to regional capaci- ties & assets
Agency & politics	Imper- sonal macro- drivers	Explicit contes- tation	Contestation + burden- sharing negotiations	Regional coalitions of firms, state, academia & civil society; place lead- ership
Policy connotation	Tech- nocratic adjust- ment, compen- sation funds	Mission-ori- ented steering	Mission steering with justice safeguards	Smart-specializa- tion, territorial JT plans, adaptive re- gional-aid schemes
Territo- rial focus	Generic regional dispari- ties	Acknowledges uneven capaci- ties	Targets adversely affected territories	Tails pathways to regional endow- ments, institutions & socio-ecological niches

Source: Own compilation

4 Conclusion: Toward a Transformative, Just, and Ecologically Responsible Regional Structural Policy

This chapter has sought to dispel the conceptual ‘fog’ that too often surrounds current debates on regional transformation. By differentiating between structural change, transformative change, just transition, and transformative regional development, we have shown that regional structural and Cohesion Policies are not merely a financial redistribution mechanism, but a multi-

layered governance arena in which distinct logics, temporalities, and justice claims intersect. Structural change provides a descriptive baseline, transformative change furnishes a normative direction, the just-transition lens specifies the conditions of fairness, and transformative regional development translates these imperatives into place-specific action. Making these distinctions explicit is the indispensable first step towards policy coherence.

The notion of a place-based, just, and green transformation is gaining traction. Nonetheless, unresolved contradictions between competitiveness and cohesion, central oversight and local agency, and early-advantage and left-behind territories cast doubt on its real-world traction. As detailed in Section 2, Germany's GRW and the EU Structural Funds were grounded in precisely this growth-and-convergence rationale. Unless these tensions are confronted head-on—by embedding binding carbon and justice criteria in every funding regulations, by systematically strengthening the governance capacity of weaker regions, and by reinforcing cross-fund coherence rules that prevent contradictory investments—regional structural and cohesion policies will yield only incremental greening rather than the transformative, equitable transition they promise.

Three structural fault lines make this risk concrete. *First*, although mission-oriented and transformative innovation policies claim to address societal challenges, Cohesion Fund allocations still hinge primarily on GDP per capita (see Section 2 and Frey & Zimmermann, 2005 for the neoclassical convergence logic that originally justified this metric), thereby entrenching the growth paradigm they purport to transcend. *Second*, institutional inertia preserves legacy procedures, cost-benefit methodologies, and evaluation metrics that favor quick-payback projects, thereby crowding out longer-term system-shifting investments. *Third*, compressed decarbonization timelines magnify cross-scalar frictions, as EU thematic targets, federal energy directives, Länder spatial plans, and municipal zoning regulations frequently pull in different directions.

Together these forces create a political economy that produces clear winners and losers: regions with diversified economies, strong R&D ecosystems, and high governance capacity are positioned to capture the bulk of green opportunities, whereas mono-sectoral or peripheral areas risk relegation to subordinate roles in logistics or waste management—thereby hollowing out the “just” in just transition.

These contradictions raise strategic dilemma: how can policymakers reconcile efficiency-oriented investment in leading regions with solidarity-based support for lagging or carbon-intensive territories. It also poses the question of

the costs—including economic and social dimensions—associated with transitioning from ecological modernization to green reindustrialization.

It remains to be decided how a regional Cohesion Policy should be designed. One approach is to introduce incentives that channel investment toward structurally weak regions, thereby promoting balanced economic development. A second is to scale up businesses already operating in those areas and use their expansion as a catalyst for reindustrialization. A third option would provide ongoing financial support to residents of lagging regions and subsidize essential infrastructure and public services such as retail, education, and health care. Historically, incentive schemes have dominated, in part because a growth-oriented compensation model cannot justify permanent transfer payments. Yet if full balanced regional development ultimately fails to maximize national growth, a cost-benefit assessment could demonstrate that focusing investments in the most competitive regions while subsidizing the others offers greater economic and environmental returns.

Beyond targeted subsidies, policymakers can strengthen regional economies by expanding local value chains, thereby closing supply gaps and capturing more value added within the region. Possible measures include mobilizing civil society, supporting cooperative business models, and piloting community-wealth building strategies. All of these measures reflect a broader shift toward bottom-up development that empowers local stakeholders rather than relying on top-down directives. Maintaining global connectivity remains essential; the goal is to anchor activities that can compete both regionally and internationally. Where local competitive potential is limited, external stimuli—such as relocating anchor industries or investing in high-quality digital and transport infrastructure—may still be required to jump-start sustainable growth.

Ultimately, the capacity of cities and regions most exposed to structural disruption and decarbonization imperatives to navigate the transition successfully hinges on several interlocking factors. Chief among these are the breadth of their economic base, their demographic and spatial scale, and the opportunities or constraints imposed by their geographic position and the broader regional context. Equally decisive is timing: territories that embark on change proactively and cultivate supportive coalitions are far more likely to establish resilient development paths than those in which entrenched interests delay or resist the necessary restructuring.

4.1 Policy Implications

Conceptual clarity, however, is only a precondition; regional structural policy must now shift from compensating yesterday's market failures to actively steering a rapid, fair, and territorially differentiated climate transition. The prevailing compensatory model—designed to mop up the social costs of market-driven change—must give way to a genuinely transformative mode of governance. Such a shift entails anticipating ecological disruptions through early-warning intelligence, guiding industrial and innovation systems towards territorially grounded transition missions, and cultivating resilient, inclusive development pathways rather than offering temporary subsidies to declining sectors. In short, regional structural policy must move from 'fire-fighting' to 'fire-proofing', i.e., from a reactive, to a preventive, anticipatory, justice-oriented approach. Three design principles are core:

Justice considerations have to be hard-wired into this new architecture. Distributional, procedural, and recognitional equity should condition access to both EU and national funds. Binding 'justice safeguards'—ranging from territorial needs assessments to participatory budgeting—can prevent well-resourced regions from capturing a disproportionate share of the benefits. Without such safeguards, the green agenda risks becoming a fresh engine of spatial inequality, undermining its own political legitimacy.

Environmental integrity must likewise become a cross-cutting principle rather than an afterthought. Aligning regional policy with planetary boundaries requires embedding science-based ecological criteria—such as carbon intensity, land take, biodiversity impacts, etc.—into every discretionary decision. It also means phasing out support for carbon-intensive activities through sunset clauses and just transition compacts, while mainstreaming circular economy, ecosystem restoration, and climate resilience goals across all funding lines. Only by making environmental screening a default gateway can regional action remain compatible with the broader goal of climate neutrality.

In a *multilevel governance* context, regional structural and cohesion policies must operate as nested, mutually reinforcing regimes that couple vertical coordination with horizontal, participatory mechanisms. At the EU level, framework regulations should impose binding environmental and justice conditionalities while granting national and regional authorities sufficient flexibility to tailor place-based transition missions to local industrial legacies and ecological assets. Member States should then translate these conditionali-

ties into mission contracts with sub-national tiers, underpinned by predictable multi-annual finance, technical assistance, and shared data infrastructures. Länder and metropolitan authorities would co-design territorial roadmaps with municipalities, civil society organizations, and groups most exposed to the green and digital transitions—such as coal workers, carers, small manufacturers, and creative communities—so that the economic, social, ecological, and cultural dimensions receive equal weight. Finally, municipalities can institutionalize participatory budgeting, community-benefit agreements, and living lab instruments, embedding experimental projects within broader regional value-chain strategies. Such a polycentric architecture, reinforced by common metrics and iterative feedback loops, would enable both advanced and lagging territories to pursue ecologically sound, socially just, and culturally resonant development trajectories while maintaining pan-European coherence.

These shifts cannot be governed through the GDP-centered indicators that have long guided cohesion spending. A revised dashboard is needed—one that couples territorial carbon budgets, inclusive-employment metrics, ecosystem-service indicators, and measures of subjective well-being. Funding allocations can then be tied to multi-dimensional mission contracts rather than to historical expenditure patterns, thereby rewarding genuine progress towards low-carbon prosperity and social inclusion.

Delivering on this policy vision will demand more than political will and revised regulations; it also calls for fresh evidence, new analytical tools, and experimental arenas capable of steering and tracking change in real time—needs that set the agenda for the research priorities outlined in the next subsection.

4.2 Future Research Avenues

Achieving the transformative, justice-oriented agenda outlined in this chapter will require a research effort commensurate with the scale of the policy challenge. Five priority avenues, each conducive to systematic experimentation, stand out.

First, an EU-wide panel that couples project-level data from ERDF, the Just Transition Fund, and national funds such as Germany's GRW with annual indicators of employment, patenting, and carbon intensity at NUTS-3 scale would permit matched difference-in-difference or synthetic-control estimation of whether, when, and under what conditions green investments alter regional development trajectories (Grillitsch et al., 2025). Embedding 'rolling

baselines', i.e., updating the reference year so that each new funding wave is measured against the most recent pre-intervention conditions rather than a distant historical benchmark, into successive programming periods would convert each funding round into a quasi-experimental cohort for the next.

Second, the governance dimension itself should become an object of experimentation. Building on mission-oriented innovation principles (Mazzucato, 2018) and recent work on place leadership (Grillitsch & Sotarauta, 2020), a set of trans regional 'transformative mission labs' could be established—for example, in a coalfield, an automotive cluster and a peripheral bio-economy region. Alternative constellations—such as central steering versus place-based coalitions, procurement mandates versus challenge prizes, and citizen assemblies versus expert panels—could be trialed under adaptive-management protocols, with adjustments made every 12–18 months based on predefined performance metrics (Geels, 2018). Such measures would also align with the call of Haldar et al. (2024) for human-centric energy just transitions that account for agency and capabilities.

Third, operational templates for justice-by-design that also satisfy EU state-aid rules remain surprisingly absent (McCauley & Heffron, 2018). Modular appraisal tools combining distributional microsimulation with ex-ante state-aid compliance checks could be piloted in two or three German Länder and a matched non-German region. The ambition is to reduce administrative friction while increasing the transparency—and contestability—of compensation measures aimed at workers and communities (Kaizuka, 2024).

Fourth, a new generation of metrics is required to capture both avoided emissions and social co-benefits at the regional scale. Integrating high-resolution satellite CO₂ readings with facility-level life-cycle analysis and regional input–output tables would enable researchers to track both direct and embodied emissions. Coupling these environmental accounts with dashboards on energy-poverty reduction, health outcomes, and gender-inclusive employment would provide the multi-criteria perspective needed for robust ex-post evaluation of transition interventions (Sovacool et al., 2025). 'Data sandboxes' in volunteer regions could validate the methodology before it is mainstreamed into regional structural and Cohesion Policy reporting.

To complement this advanced quantitative toolkit, a systematic qualitative strand should be embedded in the evaluation design. Longitudinal interviews, focus groups, and participatory mapping exercises can surface how workers, residents, and local leaders perceive the fairness, cultural fit, and everyday impacts of transition projects—dimensions that escape purely

numerical dashboards. Such evidence helps explain why regions with comparable emission cuts or employment gains may diverge in public acceptance or institutional learning, and it can feed back into the indicator set by highlighting locally salient variables (e.g., trust in institutions, gendered care burdens, sense of place). A mixed-methods protocol that triangulates satellite-based carbon estimates and input–output models with these experiential accounts would therefore yield a far richer and more legitimate assessment of regional transition performance.

Finally, comparative transition corridors and distributed living labs could generate transferable lessons across borders. Bi- or tri-national demonstration zones, such as a German-Polish coal corridor or a Franco-Spanish hydrogen valley, would pool regulatory sandboxes, joint funding calls, and shared monitoring frameworks, thereby accelerating mutual learning and exposing context-specific pitfalls (Rodríguez-Pose, 2025). Within each corridor, school retrofit schemes, community energy cooperatives, or circular industry parks could serve as micro-level laboratories whose findings can scale up to corridor-level governance.

By combining natural experiments with deliberately designed pilot schemes, the proposed research agenda can deliver the causal evidence, governance blueprints, and high-resolution metrics required to translate rhetoric into practice. Only by embracing these conceptual, procedural, and ecological re-orientations can regional policy evolve from incremental greening to genuinely transformative, just, and future-proof regional structural development.

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