Capítulo 10

Transition or Transformation? Challenging the "Orderly Transition" of Green Mining Through the Experiences in Portugal and Ecuador from a Leverage Points Perspective

Ximena Alejandra Tapia Palacios

Tapia Palacios, X. A. (2026). Transition or Transformation? Challenging the "Orderly Transition" of Green Mining Through the Experiences in Portugal and Ecuador from a Leverage Points Perspective. En A. B. Benalcázar (Coord). *Ciencias sociales y humanidades en América Latina. Investigaciones disciplinares e interdisciplinarias desde la región (Volumen I)*. (pp. 240-271). Religación Press. http://doi.org/10.46652/religacionpress.400.c847

10

Transition or Transformation? Challenging the "Orderly Transition" of Green Mining Through the Experiences in Portugal and Ecuador from a Leverage Points Perspective

Abstract

Global decarbonization agendas are increasingly grounded in forms of green extractivism, generating complex socio-environmental tensions across both the Global North and the Global South. This chapter examines, through a comparative analysis, how projects framed as part of the "green transition" reconfigure the socio-ecological systems of two case studies: the Barroso region in Portugal and the Río Blanco and Kimsacocha páramos in Ecuador, where state–corporate alliances promote so-called "orderly transitions" centered on lithium and other metal mining. While framed as indispensable to climate action, these projects reveal deep contradictions between decarbonization imperatives and territorial sustainability. The chapter situates these cases within broader debates on green extractivism, political ecology, and sustainability transformations. Conceptually, it draws on a social–ecological systems perspective and applies Donella Meadows' the Leverage Points Framework to explore different levels of systemic intervention, including parameters, feedbacks, institutional design, and underlying intent. This methodological approach allows for a structured examination of how governance arrangements, economic narratives, and community experiences interact within emerging extractive contexts. It also engages with theoretical discussions on structural, systemic, and enabling approaches to transformation in order to situate the cases within ongoing scholarly debates about transition versus transformation. By placing two geographically and politically distinct contexts into dialogue, the chapter contributes to a cross-scalar understanding of how decarbonization strategies intersect with local socio-environmental realities. It contributes to ongoing debates on transition and transformation, highlighting how systemic depth shapes the political and ecological implications of green extractivism.

Keywords: Green extractivism; sustainability; transformation; energy transition; Leverage points.

Introduction

As climate action accelerates worldwide, it increasingly exposes the contradictions of a global development model that simultaneously seeks decarbonization while intensifying extractive pressures on ecosystems and communities. At the heart of this scenario, the global energy transition, driven by the urgent need to decarbonize the economies of the Global North, has triggered a new race for critical raw materials such as lithium and copper (Andreucci et al., 2023; Dunlap et al., 2024; Riofrancos, 2023). This dynamic has led to the expansion of the "extractive frontier," transforming rural landscapes and fragile ecosystems into new "sacrifice zones" (Gayo et al., 2022; Odell et al., 2018; Zografos & Robbins, 2020), under the guise of sustainability. In this context, the critical question is not whether the transition is green, but what kind of socio-ecological order it seeks to reproduce. Sustainability thus becomes a contested political matter: what is to be sustained, and what must be fundamentally transformed?

This essay proposes a structured comparison of two illustrative cases of mining extraction: the Barroso region in northern Portugal and the Andean páramos of Río Blanco and Kimsacocha in southern Ecuador. Although they are located in different socioeconomic and geographic contexts, operating at the semi-periphery, and periphery of the global system, both systems face similar pressures derived from extractivist governance. In Portugal, Barroso, a Globally Important Agricultural Heritage System (GIAHS) site, faces the threat of large-scale lithium mining. In Ecuador, the strategic ecosystem of the Andean páramo (peatland), essential for regional water regulation, is the target of gold and copper mining projects operating under the logic of "accumulation by dispossession" (Sacher, 2017; Yánez & Moreno, 2023).

We conceptualize them as socio-ecological systems (SES), applying systems thinking (Fischer et al., 2022; Meadows, 1999), to use a "leverage points framework" that allows us to make a structured comparison of these two cases affected by large-scale mining projects. Utilizing the leverage points framework to analyze the SES of Barroso

and Río Blanco is useful for identifying the "systemic depth" of sustainability challenges that traditional cause-and-effect modeling often overlooks.

It is hypothesized that, despite the obvious differences between the two SES, from the perspective of the leverage points (Abson et al., 2017; Meadows, 1999) and the sustainability transformations (Scoones et al., 2020), some of their sustainability challenges could be very similar. Understanding these similarities, in turn, could highlight the systemic problems faced by many communities around the world where green extractive projects are being implemented.

The Problem of Extractivism in the Energy Transition

The expansion of mineral extraction to support global energy transitions, which has been known in the literature as "green extractivism", has been widely associated with significant socio-environmental costs, such as ecosystem degradation, land dispossession, forced displacement, social conflicts, human rights violations, and the erosion of cultural practices (Giljum et al., 2022; Luckeneder et al., 2021). These impacts are not incidental but reflect long-standing extractive dynamics rooted in neocolonial relations, through which resource-rich territories, particularly in the Global South, have historically been mobilized to sustain the development trajectories of industrialized economies (Matanzima & Loginova, 2024; Svampa, 2019). In this context, critical research warns that the European energy transition reproduces extractivist logics by externalizing environmental and social burdens to peripheral regions, thereby deepening existing injustices in the distribution of costs and benefits. Proposals to relocate mining activities to the Global North, often presented as a solution to ensure control of the raw material supply chain, as in the case of Covas de Barroso in Portugal, do not fundamentally alter the underlying political and economic logic of extraction and continue to carry significant socio-environmental risks (Canelas & Carvalho, 2023; Riofrancos, 2023). Nonetheless within the "green" economy, resource extraction becomes

a means to an end, appearing compatible with the goals of sustainable development and an inevitable part of securing a low-carbon future (Mcmillen Voskoboynik & Andreucci, 2022).

From an ecological justice perspective, achieving a truly just energy transition requires more than ensuring access to essential raw materials; it demands addressing structural factors such as material-intensive technologies, growth- and consumption-oriented development models, capital concentration, and the lack of wealth redistribution. Therefore, the heavy reliance on mining-based decarbonization strategies not only threatens ecosystems and water systems, particularly in ecologically vulnerable regions, but also reinforces extractive economic structures that have historically undermined social well-being, circularity, local autonomy and sustainability.

Approaches to Sustainability Transformation and Points of Leverage as Frameworks for Understanding Socio-Ecological Systems

Recent critical research on transitions to sustainability has converged on the need to move beyond depoliticized and technocratic conceptions of change. In particular, the work of Scoones et al. (2020) and Temper et al. (2018); Stirling (2011), offers a shared critique of orthodox sustainability paradigms that frame transitions as primarily managerial processes focused on technological substitution, efficiency improvements, and policy optimization. Those authors emphasize that these approaches tend to obscure underlying power relations, conflict, and inequality, while excluding alternative pathways for socio-ecological change.

Scoones et al. (2020), explicitly distinguish between 'transitions' and 'transformations', arguing that the former are usually limited to gradual adjustments within existing political and economic structures, while the latter involve deeper changes in social relations, institutional arrangements, and dominant development imaginaries. At the heart of

this distinction, they outline emancipatory principles for sustainability transformations: "taking seriously the diversity of knowledge, plural pathways, and the inherently political nature of transformations," (p. 71), where questions of who benefits, who bears the costs, and what knowledge counts once again take center stage in sustainability debates. From a complementary perspective, Temper et al. (2018), conceptualize socio-environmental change as inherently controversial and conflictive, highlighting the role of grassroots struggles, resistance, and what they describe as "unruly" or bottom-up transformations. Instead of treating conflict as a barrier to sustainability, this approach recognizes it as a constitutive element of transformative change, particularly in contexts marked by extractivism and territorial dispossession.

In light of these critical perspectives on sustainability transitions, Meadows' (1999), system change theory on leverage points framework helps us to understand how systemic change occurs across multiple levels of depth and how these levels interact in complex, non-linear ways. Building on Meadows' original hierarchy of twelve places to intervene in complex systems, Abson et al. (2017), further refined this framework by consolidating leverage points into four interconnected realms of systemic depth: parameters, feedbacks, system design, and system intent; these domains are structured hierarchically but interact dynamically. The system's deeper characteristics constrain and shape its more shallow ones: for example, a system's intention (dominant paradigms and objectives) defines its design (rules, institutions), which in turn structures feedback mechanisms and material parameters. Therefore, the author argues that interventions at the parameter level tend to fail if the system's design or intention contradicts sustainability goals. At the same time, changes at more superficial levels can, over time, influence deeper levels, whereas repeated adjustments to parameters or feedback loops can catalyze changes in institutional norms or even in the overall paradigms that guide the system.

Beyond its conceptual value, the leverage points framework has been used as a comparative framework for analyzing social-ecological systems across different contexts. Fischer et al. (2022), demonstrate how

mapping interventions and dynamics across leverage points enables systematic comparison of rural landscapes. In this sense, adopting a leverage points perspective allows sustainability transformations to be analysed not as isolated interventions, but as configurations of change across different levels of systemic depth. This approach is particularly relevant for examining green extractivism, where policy debates often focus on optimizing material flows and supply chains, while leaving underlying extractive governance structures and growth-oriented paradigms largely intact.

At the same time, it is important to recognize that mapping transformations onto leverage points is heuristic rather than deterministic. Interventions at deep leverage points do not automatically produce emancipatory or just outcomes, and even actions labeled as "transformative" may reproduce existing power asymmetries if dominated by actors with structural authority. Furthermore, socio-ecological change is inherently contingent, situated, and conflictive, meaning that the activation of leverage points must be interpreted in context, considering historical, territorial, and political dimensions. By maintaining this critical perspective, a leverage points framework can serve as a powerful tool to systematically compare socio-ecological systems, while foregrounding questions of power, justice, and plural knowledge, setting the stage for the comparative analysis of green extractivism in Barroso, Portugal, and Río Blanco-Kimsacocha, Ecuador.

The essay first presents the two case studies[1]; it then offers a methodological overview of how the leverage points perspective was applied to the two cases; and finally, it analyzes and discusses the results, and offers some conclusions.

1 *It could be argued that there are three case studies if Río Blanco and Kimsacocha are counted as separate SESs. However, for analytical purposes, it has been decided to treat them as a single SES, given that they face similar macro challenges and they both belong to the Cajas Massif Biosphere Reserve.*

Case of Study Landscapes

Within the framework of a systemic analysis inspired by the methodology of Fischer et al. (2022), the characterization of the landscape of the two case studies seeks to integrate geographical, ecological, and socioeconomic dimensions to establish the preconditions for the leverage points analysis.

In the Ecuadorian case, the focus is on the complex socio-ecological system of the Cajas Massif, specifically in the areas of influence of the Río Blanco and Loma Larga (Kimsacocha) metal mining projects. The Cajas Massif is located in the province of Azuay, south of the Ecuadorian Andes. This landscape is characterized by páramo ecosystems and high-altitude water recharge areas, located between 2,760 and 3,960 meters above sea level. The system is ecologically strategic, as it functions as a "water buffer" and a regulator of the hydrological cycle that feeds both the Pacific slope and the Amazon basin. In addition, these páramos act as highly efficient carbon sinks due to the high organic matter content in the soil (Villa et al., 2019). Much of this landscape is part of the Cajas Massif Biosphere Reserve, recognized by UNESCO, and includes protected areas such as Cajas National Park and Kimsacocha National Recreation Area.

The Landscape is Marked by Two Territorial Realities:

The Parish of Molleturo (Río Blanco): Molleturo suffers from structural isolation and high poverty, with 90.35% of the population living with unsatisfied basic needs (NBI). Most of the population works in the primary sector of the economy, consisting of agriculture, livestock, forestry, fishing, and hunting (64.18% of the active population), relying on subsistence farming organized by altitude: tubers and vegetables in the highlands, and cacao, banana, and coffee in the lowlands. As of 2010, the population was 7,166 inhabitants, with a density of 5.4 people per square kilometer. While 93.5% of the population self-iden-

tified as Mestizo in 2010, the population maintains strong ancestral ties and an identity in the process of reemergence (ethnogenesis) as Kichwa Kañari or Molleturo Kichwas. According to Quizhpe (2020), the reemergence or redefinition of the indigenous identity of the Molleturo population occurs in the context of the conflict generated by large-scale mining.

The Girón Parish (Loma Larga/Kimsacocha): Kimsacocha comes from the Kichwa language and means "three lagoons." The Girón canton covers 35,010 hectares in the central-south region of Azuay and comprises the parishes of Girón, La Asunción, and San Gerardo. It has an average altitude of 2,316 meters above sea level, transitioning from subtropical valleys to high-altitude páramos. The hydrological system belongs to the Jubones river basin, which drains toward the Pacific through eleven micro-watersheds. In 2015, the population was 13,191, though there is a trend of demographic decline due to exceptionally high rates of international migration, particularly to the United States. The poverty rate by NBI stands at 61.30%. Unlike the isolated economy of Molleturo, Girón is deeply integrated into regional commercial networks, particularly through the dairy industry and livestock production. The economy is sustained by a mix of primary production (48.31%) and substantial foreign remittances from migrants, which has led to socio- demographic vulnerabilities and the loss of agricultural labor. The parish is defined by a strong organizational culture surrounding 35 community-managed water systems, which have become central actors in the resistance against large-scale mining.

Historically, this landscape has transitioned from a community-based land and water management system to a state-driven "primary-export extraction mode." Currently, the system faces pressure from the expansion of the mining frontier for the extraction of gold, silver, and copper, being the latter a "strategic" metal for the renewable technologies, due to its excellent properties as an electrical conductor (Shannak et al., 2024). Although both communities share strategic functions in the Andean páramo hydrological system, they face different systemic pressures from the mining sector. Molleturo is facing a

transition to neoliberal mining governance characterized by physical militarization and the appropriation of communal lands, while the Girón conflict centers on the failure of the state and mining companies to comply with the mandate enacted through the mechanism of direct democracy (the 2019 popular consultation) prohibiting mining activity in the páramos or water sources of the Kimsacocha Hydrological System.

The Barroso region, located in the mountainous enclave of northern Portugal within the municipalities of Boticas and Montalegre, represents a rare instance of a co-evolved, resilient social-ecological system (SES) (Dunlap & Riquito, 2023). In 2018, its unique agro-silvo-pastoral system was recognized by the UN Food and Agriculture Organization (FAO) as Portugal's first Globally Important Agricultural Heritage System (GIAHS), a distinction that acknowledges the inseparable link between local biodiversity, traditional farming techniques, and communal values.

From an ecological perspective, Barroso constitutes a vital hydrological hub characterized by high rainfall and a dense network of tributaries feeding the Douro and Tâmega rivers. It provides essential habitats for high-conservation-value species like the Iberian Wolf. Socio-economically, the system is characterized by a communal land-tenure model, with baldios comprising up to approximately two thousand hectares (Sa Rego et al., 2024). This resource system supports a traditional economy based on endemic Barrosã livestock (Sa Rego et al., 2024).The resilience of this SES is maintained through ancestral socio-technical institutions, such as the torna da água irrigation system, which governs water distribution and reinforces community-led territorial management.

However, this SES is currently facing unprecedented exogenous pressure from "green extractivism". The Portuguese state has identified the Barroso as a strategic "commodity frontier" due to its spodumene lithium deposits, allegedly the largest in Western Europe. Projects such as the "Mina do Barroso" (owned by Savannah Resources) and "Mina

de Romano" (owned by Lusorecursos) seek to integrate this landscape into the global battery value chain for the European Union's energy transition (Riquito, 2025; Silva & Sareen, 2023).

Methodology

Research Design and Epistemological Orientation

This study adopts a qualitative, comparative case study design grounded in systems thinking. It investigates whether contemporary projects of "green mining" constitute a transition or a deeper socio-ecological transformation by analyzing two coupled social–ecological systems (SES): the Barroso region in Portugal and the Río Blanco/Kimsacocha Andean páramos in Ecuador. Conceptualizing these territories as SES enables the analysis to move beyond linear cause-and-effect explanations and instead examine dynamic interactions between ecological processes, institutional arrangements, economic imperatives, and sociocultural values.

The research relies primarily on documentary content analysis and thematic analysis of secondary sources, complemented by targeted fieldwork observations conducted by the author. A structured comparative analysis was performed to identify convergences and divergences across the two cases, with particular attention to systemic depth and transformative potential.

Data Collection and Selection Criteria

The empirical basis of the study consists of approximately 30 mixed secondary sources, including peer-reviewed academic articles, institutional and policy reports, legal documents, and grey literature. These materials were selected based on three criteria:

1. Relevance to the research question, particularly their engagement with lithium and gold mining projects framed as part of the green transition.

2. Empirical grounding, privileging sources that documented socio-ecological impacts, governance dynamics, or community experiences.

3. Analytical complementarity, ensuring coverage of ecological, social, economic, and political dimensions across both case studies.

The documentary review for the Ecuadorian case was conducted as part of an ongoing thematic analysis initiated in 2024, while the Portugal case was updated through an expanded and targeted literature review to ensure analytical symmetry. Targeted fieldwork observations primarily related to community mobilization, territorial governance practices, and public discourse, were incorporated to contextualize and triangulate documentary findings. The dataset is not intended to be exhaustive; rather, it supports an exploratory and theory-informed diagnostic of systemic dynamics under conditions of so-called "green extractivism.".

Analytical Framework: The Leverage Points Diagnostic

The central analytical pillar of this study is the Leverage Points Framework, originally developed by Meadows (1999) and further operationalized by Abson et al. (2017) and Fischer et al. (2022). This framework conceptualizes systems as hierarchically structured across four levels of intervention depth, parameters, feedbacks, design, and intent, allowing the differentiation between shallow, technical adjustments and deep, paradigmatic transformations. It was selected because it directly supports the article's core objective: assessing whether contemporary "green mining" initiatives represent systemic transformation or merely an "orderly" transition within prevailing extractivist paradigms.

Thematic Analysis and Synthesis Statement Generation

The analysis followed a structured thematic procedure inspired by Fischer et al. (2022). First, documentary materials were examined iteratively to identify recurring socio-ecological themes. First, documentary materials were read iteratively to identify recurring themes related to socio-ecological impacts, governance arrangements, community responses, and sustainability narratives. Particular analytical attention was given to:

- Hydrological regulation and ecosystem integrity in highland territories;
- Institutional mechanisms enabling or constraining mining expansion;
- Community experiences of participation, resistance, and legal mobilization;
- Discursive framings of mining as a climate or development solution.

From this interpretive process, concise synthesis statements were generated. Each statement distilled a key empirical finding into a single analytical proposition. These statements constitute the primary analytical units of comparison.

Each synthesis statement was subsequently classified according to its systemic depth (parameters, feedbacks, design, or intent). This step made explicit whether documented interventions primarily targeted shallow, technical adjustments or deeper structural and paradigmatic dimensions.

Subsequently, synthesis statements from the two case studies, Portugal and Ecuador, were organized in a structured comparative matrix. This facilitated the identification of convergences, divergences, and cross-scalar dynamics. An inductive logic analogous to thematic

coding was applied to reformulate shared patterns into joint statements. Each statement was also assigned a normative valuation (Positive, Negative, or Ambiguous) and qualitatively mapped (0 to +++) to indicate its relative presence or intensity, enabling the visualization of systemic trends without reducing the analysis to quantitative metrics.

Integration with Sustainability Transformations Theory

To deepen interpretation, the leverage points analysis was complemented by the Sustainability Transformations Framework (Scoones et al., 2020), which distinguishes between structural, systemic, and enabling transformations. This integration allowed the study to assess whether observed dynamics reflect incremental reforms or deeper reconfigurations of governance, institutions, and societal values. Community resistance practices were thus interpreted as potential forms of transformative agency operating at deep leverage points.

Methodological Scope and Limitations

Overall, the methodology constitutes an exploratory and theory-informed diagnostic of two social–ecological systems under conditions of "green extractivism." As one of the first structured applications of the leverage points framework to comparative green extractivism contexts, this research should be understood as a theory-driven diagnostic exercise. Its aim is not comprehensive territorial documentation, but the identification of systemic patterns and mismatches that illuminate the depth of contemporary sustainability interventions.

Results

Summary of findings in each case study

The analysis of the SES on Río Blanco and Kimsacocha reveals that due to the implementation of mega-mining, a trajectory of syste-

mic unsustainability is being followed, driven by the expansion of the "raw materials commodity frontier," characterized by "accumulation by dispossession" in strategic ecosystems.

With regard to extractivist governance, the resource exploitation of strategic ecosystems such as the páramos is legitimized through a developmentalist narrative that couples national economic growth with the transnational export of copper, driven by the 'green urgency' of the Global North's energy transition. Consequently, local biocultural needs and community well-being are systematically subordinated to global market demands.

Ecologically and technically, the mining operations in Río Blanco drive irreversible degradation of vital water regulation functions. The project has already caused the desiccation of lagoons, such as Cruz Loma, and severe soil degradation, jeopardizing the watersheds that sustain urban centers like Cuenca. These impacts are compounded by high technical risks, including potential acid mine drainage and the leaching of arsenic into the water system, which poses a direct threat to public health and agricultural productivity.

On the Socio-political dimension, the project catalyzes a rupture of the social fabric, transforming previously cohesive communities into landscapes of conflict. The implementation of "corporate social technologies" by companies led to severe internal divisions. Families and neighbors became polarized, with some members accepting corporate donations and jobs while others defended the water. On the other hand, a state-corporate alliance employs micro-biopolitical violence and the criminalization of environmental defenders to manufacture consent and discipline dissent (43 defenders prosecuted in Rio Blanco, three water rights activists have been murdered) (Cardona, 2022; Yanez, 2021). Besides that, to delegitimize resistance, the State employs a narrative dichotomy between "legal" (responsible) and "illegal" (criminal) mining. This strategy instrumentalizes the damage caused by illegal operations to justify industrial mining as the only "civilized" solution, effectively ignoring the environmental liabilities generated by legal projects.

Economically, this extractivist model offers marginal national benefits, contributing a mere 0.3% to GDP, according to Central Bank data, while actively fostering job precariousness and the erosion of territorial autonomy for rural communities. In Río Blanco, initial promises of 1,500 jobs were eventually reduced to fewer than 100 for local residents, most of which were manual and non-technical. This creates a "labor hierarchy" where women are relegated to precarious, temporary roles in cleaning or cooking, while the core mining operations are handled by machines or outside technicians.

An analysis of the SES of Barroso, in northern Portugal, reveals a complex web of interdependencies between ancestral communitary practices and the contemporary pressure of "green extractivism."

The system is currently producing significant threats to hydrological stability. Technical data indicates that the proposed mining operations would consume approximately 510 to 570 million liters of water annually. Independent peer reviews of Environmental Impact Assessments (EIAs) have flagged high risks of acid mine drainage, with potential discharge pH levels as low as 3.5 to 5, which could lead to irreversible heavy metal contamination of regional aquifers. Furthermore, mining activities threaten to fragment the habitat of the Iberian Wolf, with the Public Ministry recently noting that proposed "minimization measures" lack demonstrated effectiveness to prevent local extinction.

While the state narrative promises 215 direct jobs and over €1.2 billion in national GNP contributions, local findings suggest a net loss in regional economic resilience. The system is producing "labor exclusion" for the local agrarian workforce, as modern mining is highly mechanized and excludes traditional peasant livelihoods. Furthermore, the system is facilitating a "bureaucratic land grab" through the use of "administrative easements" (servidão administrativa), which allows companies temporary access to private and communal lands against local will, disrupting the baldios management system.

Socially, the system is producing a rupture of the social fabric through sophisticated social engineering and counterinsurgency tech-

niques. Data shows a pervasive use of "divide and conquer" tactics, such as offering land purchase prices significantly above market value to specific individuals, sowing internal mistrust and polarization. Procedurally, the findings highlight a "moral vacuum" in decision-making, evidenced by the Portuguese Environmental Agency (APA) facing a complaint before the Aarhus Convention for withholding critical project information from the public.

Structured comparison among case studies

System characteristics at the parameter level

Table 1.
Social-ecological synthesis statements at the parameter level identified

Synthesis statement	Effect on Sustainability	PT	EC
Territories provide key ecosystem services (water regulation, pasture, soils) essential to local livelihoods	Positive	+++	+++
Water availability and quality directly threatened by mining activities	Negative	+++	++
Strategic mineral stocks are large, but their national economic contribution is marginal	Ambiguous	++	+++
Mining concessions overlap with high-value socio-ecological systems (GIAHS / Páramo)	Negative	+++	+++
Local biodiversity levels are high and include endemic and threatened species.	Positive	+++	+++
Mineral deposits contain high concentrations of toxic elements, increasing baseline environmental risk	Negative	++	+++
Water discharge parameters indicate high risk of acid mine drainage	Negative	++	+++
Physical proximity between mining operations and residential areas is extremely high	Negative	++	+++
Direct employment generation from mining is structurally lower than projected.	Negative	++	++

Rural depopulation and population aging reduce local capacity to resist land-use change.	ambiguous	+++	++
Extractive infrastructure expansion reshapes territorial connectivity and land-use patterns	ambiguous	++	+++
Global demand for "green" minerals acts as the main external driver	Negative	+++	++

Note: Compiled by the author

Statements were classified as likely to have a positive, negative, or ambiguous effect on sustainability. (Legend: + denotes weakly present; ++ moderately present; +++ strongly present; 0 denotes not present; PT = Portugal, EC= Ecuador).

In both cases, the systems have strategic biophysical reserves (biodiversity, water, minerals) that coexist spatially with planned or active extractive infrastructure, creating highly sensitive territorial overlaps and accentuating the vulnerability of the system. This reveals a relational matrix in which biophysical and economic parameters constitute the material basis on which social and political feedbacks will be articulated. We can see that statements with a negative or ambiguous effect on sustainability predominate. In contrast, a small but solid subset of parameters associated with traditional agroecological systems and biodiversity has clearly identifiable positive effects in both cases. These parameters function as conditions of possibility and tension; they create significant local risks and, at the same time, shape political opportunities that both state and corporate actors use to legitimize an expansion of the extractive front.

System characteristics at the feedback level

Table 2.
System characteristics at the level of feedbacks

Synthesis statement	Type	Effect on Sustainability	PT	EC
Extractive fiscal dependence reinforces the expansion of mining frontiers.	Reinforcing	Negative	++	+++

Synthesis statement	Type	Effect on Sustainability	PT	EC
The use of "corporate social technologies" (donations and precarious jobs) creates a loop of dependency that undermines economic local autonomy.	Reinforcing	Negative	++	+++
Legal victories and popular consultations act as negative feedback (buffer), interrupting the trajectory of the extractive project	Balancing	Positive	++	+++
The use of militarization and criminalization creates a cycle of reinforcement that aims to desmobilize resistance and normalize dispossession	Reinforcing	Negative	+	+++
"Bureaucratic violence" and "temporal burnout" weaken community response capacity over time	Reinforcing	Negative	+++	+++
The fragmentation of the social fabric generates a loop that reinforces internal conflicts (family and community), weakening territorial governance	Reinforcing	Negative	++	+++
Traditional agro-silvo-pastoral systems generate stabilizing socio-ecological feedbacks	Balancing	Positive	+++	+++
The framing of illegal mining as a threat is used to legitimize industrial extraction	Reinforcing	Ambiguous	0	+++
Controlled extraction is framed as necessary to avoid geopolitical instability and supply insecurity.	Reinforcing	Ambiguous	++	+
Rising global demand reinforces national extractive urgency, requiring continuous expansion of mining frontiers.	Reinforcing	Negative	+++	++

Note: Compiled by the author

Statements were classified as likely to have a positive, negative, or ambiguous effect on sustainability. (Legend: + denotes weakly present; ++ moderately present; +++ strongly present; 0 denotes not present; PT = Portugal, EC= Ecuador).

The feedback arising from these conditions is not neutral. Some reinforcements consolidate the extractivist trajectory, while others act as counterweights. The balancing feedbacks identified, mainly those

linked to legal actions, popular consultations, and local territorial management, although clearly present, demonstrate a more limited and contingent capacity to counteract the dominant dynamics. These feedbacks tend to operate episodically and depend on specific institutional conditions rather than structural stabilizers of the system. On the other hand, extractivist reinforcements tend to produce systemic and far-reaching effects, probably because they are anchored in capital flows and external demands.

Unlike parameter-level analysis, the feedback realm demonstrates that the conflict is not merely about "how much copper" or "how much lithium," but about the speed and nature of the systemic response. In Ecuador, the feedback of physical repression is more acute, while in Portugal, procedural (bureaucratic) exclusion feedback predominates. Violence is not just a parameter (number of arrests) or a design (police regulations), but a recurring internal dynamic; community resistance generates a state/corporate response of repression that seeks to induce the cessation of action through fear and physical and psychological exhaustion. This feedback loop of fear acts to "discipline" subjectivities, attempting to force the system into a state of resignation or inertia.

System characteristics at the design level

Table 3.
System characteristics at the level of design

Synthesis statement	Effect on Sustainability	PT	EC
Governance and decision-making structures are centralized and vertical, limiting meaningful local participation in extractive-related decisions	Negative	++	++
Information flows regarding environmental risks and impacts are opaque, asymmetrical, and controlled by state–corporate actors	Negative	++	+++

Regulatory frameworks prioritize extractive licensing and declarations of public utility over environmental safeguards and territorial rights.	Negative	+++	+++
There is a persistent mismatch between higher-level policy goals and locally evolved socio-ecological organisations	Negative	+++	+++
Locally rooted processes of community reorganization re-emerge	Positive	++	+++
Community networks actively extend beyond territorial boundaries to engage allies and external actors, strengthening the social basis for sustained resistance	Positive	++	++
Judicial and oversight institutions intermittently function as corrective mechanisms within the governance design	Positive	++	+++
Corporate strategies of "controlled inclusion" are embedded within the institutional design, substituting structural participation with selective benefits	Negative	++	+++
The governance design treats socio-ecological systems as sectoral components, treating nature as a set of isolated and quantifiable stocks for the market.	Negative	+++	+++
Community-based self-organization persists as an alternative governance architecture operating in tension with formal institutional designs	Positive	+++	+++
Global demand is translated into strategic minerals policies and accelerated licensing regimes	Ambiguous	+++	++
Legal systems recognise collective and environmental rights (e.g. common land, rights of nature, prior consultation), but their implementation design is fragile and highly dependent on ex post judicial activation.	Ambiguous	++	+++

Note: Compiled by the author

Statements were classified as likely to have a positive, negative, or ambiguous effect on sustainability. (Legend: + denotes weakly present; ++ moderately present; +++ strongly present; 0 denotes not present; PT = Portugal, EC= Ecuador).

According to Fischer et al. (2022), design-level leverage points concern rules of the system, institutional arrangements, access to information, distribution of decision-making power, legal rights and enforcement architectures.

At the design level, the conflict in these SES lies in the clash between two governance models. In Portugal, this is reflected in the EU Critical Raw Materials Regulation and the 2021 Mining Law, which seek to guarantee the strategic supply of critical raw materials. In Ecuador and Portugal, this design manifests itself in the classification of projects as "strategic," which allows for the suspension of territorial rights in the name of national interest. This institutional design concentrates authority, obscures information, and prioritizes rapid licensing mechanisms. The regulatory and procedural architecture translates, on a practical scale, the policy intention; the rules of the game favor quick solutions geared toward mineral supply and strategic security, what Abson et al. (2017) and Meadows (1999), would describe as a design that limits the possibility of change at more superficial levels.

However, the profound potential of the designs for resistance and "re-existence" in these SES systems comes from the transformative power of self-organization. In Barroso, the management of communal lands represents a resilient grassroots design that prevents the total commodification of land. Similarly, in Ecuador, judicial victories safeguarded by the 2008 Constitution (which recognizes nature as a subject of rights), together with ongoing local demands for democratic decisions to be enforced, demonstrate how interventions at the fundamental regulatory level can curb exploitation in sensitive ecosystems such as the páramo. Therefore, within these "Other" designs, alternative architectures coexist: communal regimes for managing common lands, translocal defense networks, and popular democracy channels that, although fragile, operate as parallel *transformations* that challenge authority, narratives and reconfigure possibilities for action.

System characteristics at the level of intent

Table 4.
System characteristics at the level of intent

Synthesis statement	Effect on Sustainability	PT	EC
The paradigm of developmentalism and the "national interest" articulates state goals, subordinating biocultural heritage and local livelihoods to macroeconomic objectives.	Negative	+	+++
There is a clash of paradigms between an instrumental/extractive view of nature and a relational/pluriversal view that conceives of nature as a subject or bearer of intrinsic value.	Ambiguous	++	+++
Community-led visions emphasize ecological integrity, relational knowledge, and intergenerational responsibility as central goals	Positive	+++	+++
Sustainability considerations are rhetorically incorporated into policy, but remain subordinate to the overarching goal of economic growth.	Ambiguous	+++	++
Sustainability narratives are contested and heterogeneous, with conflict/dispute recognized as constitutive rather than as an obstacle to transformation	Ambiguous	++	++
The dominant narrative conceives of ecological transition as dependent on the expansion of "green" mineral extraction (green extractivism), prioritizing supply and demand as a non-negotiable systemic objective.	Negative	+++	+

Note: Compiled by the author

Statements were classified as likely to have a positive, negative, or ambiguous effect on sustainability. (Legend: + denotes weakly present; ++ moderately present; +++ strongly present; 0 denotes not present; PT = Portugal, EC= Ecuador).

The intent realm crystallizes the priorities and paradigms that legitimize or question the SES trajectories. Here, the evidence shows a clear clash: the hegemonic intention of the state and the private sector sees the transition as an opportunity to reproduce a developmentalist

and productivist model, "green extractivism", while emerging intentions, articulated by re-existence movements, propose an alternative horizon centered on the reproduction of life, epistemological plurality, and water sovereignty; not without internal tensions. This conflict of intentions may show why many "green" policies translate into parametric interventions (more extraction, technological mitigation) without altering the design or purposes of the system.

Discussion

Relating these findings to Scoones (2020) and Temper (2018), the interventions that predominate in both cases correspond, for the most part, to "orderly transitions", technical and administrative adjustments that preserve the basic architecture of the traditional growth and development system; as "responsible mining" and "green mining" is used by the Portuguese and Ecuadorian governments to present extractivism as a civilized, orderly component oriented toward a green global economy. These transitions operate at superficial levels (parameters and some feedbacks) and, except for legal contingencies or intense mobilizations, do not alter the design or systemic intention. The focus on numerical constants (volume of lithium or ounces of gold) and flow structures (how much of mining revenues are reflected in national GDP) is a shallow leverage. The persistence of negative impacts, even with the adjustment of these figures, suggests that the system's design does not seek socio-ecological sustainability, but rather to increase and sustain the exploitation of critical minerals, so that continuing to intervene at these levels will serve little or no purpose.

The initiatives that Temper calls "unruly transformations" and that Scoones classifies as transformations delve deeper into re-structuring and re-thinking; they dispute rules, reconfigure society-nature relationships, and question the green extractivism and developmentalist paradigm. In Río Blanco-Kimsacocha, these disputes are more intense, with higher levels of conflict and judicial action, while in Barroso, the dynamic is more contained but equally significant, with local resistance slowing down and questioning the extractive expansion.

The practical policy that emerges from this diagnosis is clear: if the systemic intention does not change, that is, if the objective continues to be to maximize supply and growth, then solutions focused on parameters and technical management will continue to reproduce inequalities and create new sacrifice zones. To move toward a just transformation, it is necessary to redirect intervention toward deep leverage points: democratizing information flows, reconfiguring decision-making rules to include the binding recognition of local organizations, and, crucially, re-politicizing intention through processes that validate plural values over system objectives. In terms of research, this implies tracing not only material relationships but also the narrative trajectories that naturalize the extractive imperative, as well as the organizational practices that can subvert it.

Conclusion

Literature suggests that transformations to sustainability are fundamental changes in the structural, functional, relational, and cognitive aspects of socio-technical-ecological systems that result in novel patterns of interactions and outcomes. To enable these transformations effectively, a multi-layered approach is required that moves beyond incremental transitions toward radical, systemic shifts.

The leverage points framework, as synthesized by Abson et al. (2017) and applied by Fischer et al. (2022), helps us understand the hierarchical "depth" of interventions within complex social-ecological systems. By refining Meadows' (1999), original twelve leverage points into four nested realms, parameters, feedbacks, design, and intent, the framework allows us to categorize system characteristics based on their transformative potential and reveal systemic mismatches that impede sustainability transformations, particularly when a system is delivering precisely what it was designed to do rather than what it claims to prioritize (Fischer et al., 2022).

For instance, in the cases of the Barroso landscape in Portugal and Río Blanco-Kimsacocha in Ecuador, the framework exposes how

"green" transition rhetoric at the parameter and design levels often masks a deeper "intent" of capital accumulation and productivist logic. By identifying that the root of the problem lies at the level of intent, as in valuing nature as a commodity rather than as a relational being, the framework clarifies that shallow interventions, such as higher environmental standards, are insufficient to prevent the creation of "green sacrifice zones". This analytical depth shifts the focus from managing transitions through "orderly control" to enabling transformations through the restructuring of power and the rethinking of knowledge production.

To foster genuine sustainability transformations, the leverage points framework suggests that intervening at the design and intent levels is required to disrupt unsustainable path dependencies. Since it is often impossible to directly "engineer" a change in deep paradigms, the framework proposes "intervention detours," where targeted shifts in institutional rules or information flows can eventually cascade downward to reorient the system's overarching goals (Abson et al., 2017). This approach also supports the emergence of "re-existence" as an onto-political struggle, where local communities affirm sustainable paths, life-centered ways of being that transcend the dominant extractivist paradigm. Ultimately, a leverage points perspective encourages an integrated analysis that links biophysical stability with structural, relational, and cognitive shifts, moving beyond incremental fixes toward radical, systemic change.

References

Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., von Wehrden, H., Abernethy, P., Ives, C. D., Jager, N. W., & Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio, 46*(1), 30–39. https://doi.org/10.1007/s13280-016-0800-y

Andreucci, D., García López, G., Radhuber, I. M., Conde, M., Voskoboynik, D. M., Farrugia, J. D., & Zografos, C. (2023). The coloniality of green extractivism: Unearthing decarbonisation by dispossession through the case of nickel. *Political Geography, 107*. https://doi.org/10.1016/j.polgeo.2023.102997

Canelas, J., & Carvalho, A. (2023). The dark side of the energy transition: Extractivist violence, energy (in)justice and lithium mining in Portugal. *Energy Research & Social Science, 100*. https://doi.org/10.1016/j.erss.2023.103096

Cardona, A. P. (2022, 03 de noviembre). Minería ilegal de oro cobra la vida de una defensora ambiental en Ecuador y desata violencia. *Noticias ambientales*. https://n9.cl/zgcuk

Dunlap, A., Verweijen, J., & Tornel, C. (2024). The political ecologies of "green" extractivism(s): An introduction. *Journal of Political Ecology, 31*(1), 1–14. https://doi.org/10.2458/jpe.6131

Fischer, J., Abson, D. J., Dorresteijn, I., Hanspach, J., Hartel, T., Schultner, J., & Sherren, K. (2022). Using a leverage points perspective to compare social-ecological systems: A case study on rural landscapes. *Ecosystems and People, 18*(1), 119–130. https://doi.org/10.1080/26395916.2022.2032357

Gayo, E. M., Muñoz, A. A., Maldonado, A., Lavergne, C., Francois, J. P., Rodríguez, D., Klock-Barría, K., Sheppard, P. R., Aguilera-Betti, I., Alonso-Hernández, C., Mena-Carrasco, M., Urquiza, A., & Gallardo, L. (2022). A cross-cutting approach for relating Anthropocene, environmental injustice and sacrifice zones. *Earth's Future, 10*(4). https://doi.org/10.1029/2021EF002217

Giljum, S., Maus, V., Kuschnig, N., Luckeneder, S., Tost, M., Sonter, L. J., & Bebbington, A. J. (2022). A pantropical assessment of deforestation caused by industrial mining. *Proceedings of the National Academy of Sciences, 119*(38). https://doi.org/10.1073/pnas.2118273119

Luckeneder, S., Giljum, S., Schaffartzik, A., Maus, V., & Tost, M. (2021). Surge in global metal mining threatens vulnerable ecosystems. *Global Environmental Change, 69*. https://doi.org/10.1016/j.gloenvcha.2021.102303

Matanzima, J., & Loginova, J. (2024). Sociocultural risks of resource extraction for the low-carbon energy transition: Evidence from the Global South. *The Extractive Industries and Society, 18*. https://doi.org/10.1016/j.exis.2024.101478

Mcmillen Voskoboynik, D., & Andreucci, D. (2022). Greening extractivism: Environmental discourses and resource governance in the 'Lithium Triangle.' *Environment and Planning E: Nature and Space, 5*(2), 787–809. https://doi.org/10.1177/25148486211006345

Meadows, D. (1999). *Leverage points: Places to intervene in a system*. Sustainability Institute, The Donella Meadows Project, Academy for System Change. https://n9.cl/xkf21

Odell, S. D., Bebbington, A., & Frey, K. E. (2018). Mining and climate change: A review and framework for analysis. *The Extractive Industries and Society, 5*(1), 201–214. https://doi.org/10.1016/j.exis.2017.12.004

Quizphe, C. (2020). *La commoditización de las subjetividades: La minería en la provincia del Azuay, Ecuador y los casos de los proyectos Río Blanco y Loma Larga*. Facultad Latinoamericana de Ciencias Sociales (FLACSO).

Riofrancos, T. (2023). The security–sustainability nexus: Lithium onshoring in the Global North. *Global Environmental Politics, 23*(1), 20–41. https://doi.org/10.1162/glep_a_00668

Riquito, M. (2025). "Barroso is not to be sold, it is to be loved and defended:" Affective mobilizations for land and life in the context of green extractivism. *Capitalism Nature Socialism, 36*(4), 27–51. https://doi.org/10.1080/10455752.2025.2562631

Sa Rego, J., Amoedo, D., & Pereira, C. (2024). *Os Baldios de Covas do Barroso: Uma forma secular de propriedade, gestão e uso comunitário da terra*. RHE Initiative. https://www.rhe-initiative.pt/baldios-de-covas-do-barroso

Sacher, W. (2017). *Ofensiva megaminera china en los Andes: Acumulación por desposesión en el Ecuador de la "Revolución Ciudadana."* Editorial Abya-Yala.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P., & Yang, L. (2020). Transformations to sustainability: Combining structural, systemic and enabling approaches. *Current Opinion in Environmental Sustainability, 42*, 65–75. https://doi.org/10.1016/j.cosust.2019.12.004

Shannak, S., Cochrane, L., & Bobarykina, D. (2024). Strategic analysis of metal dependency in the transition to low-carbon energy: A critical examination of nickel, cobalt, lithium, graphite, and copper scarcity using IEA future scenarios. *Energy Research & Social Science, 118*. https://doi.org/10.1016/j.erss.2024.103773

Silva, L., & Sareen, S. (2023). The calm before the storm? The making of a lithium frontier in transitioning Portugal. *The Extractive Industries and Society, 15*. https://doi.org/10.1016/j.exis.2023.101308

Stirling, A. (2011). Pluralising progress: From integrative transitions to transformative diversity. *Environmental Innovation and Societal Transitions, 1*(1), 82–88. https://doi.org/10.1016/j.eist.2011.03.005

Svampa, M. (2019). *Neo-extractivism in Latin America: Socio-environmental conflicts, the territorial turn, and new political narratives*. Cambridge University Press. https://doi.org/10.1017/9781108752589

Temper, L., Walter, M., Rodriguez, I., Kothari, A., & Turhan, E. (2018). A perspective on radical transformations to sustainability: Resistances, movements and alternatives. *Sustainability Science, 13*(3), 747–764. https://doi.org/10.1007/s11625-018-0543-8

Villa, J. A., Mejía, G. M., Velásquez, D., Botero, A., Acosta, S. A., Marulanda, J. M., Osorno, A. M., & Bohrer, G. (2019). Carbon sequestration and methane emissions along a microtopographic gradient in a tropical Andean peatland. *Science of the Total Environment, 654*, 651–661. https://doi.org/10.1016/j.scitotenv.2018.11.109

Yanez, I. (2021, 19 de marzo). Andrés Durazno, defensor del agua y de los páramos de Río Blanco en el Azuay. Una vida cegada en el contexto extractivo minero. *Acción Ecológica*. https://n9.cl/s2ugkt

Yánez, I., & Moreno, C. (2023). Acumulación y desposesión por descarbonización. En M. Lang, B. Bringel, & M. A. Manahan, (eds.). *Más allá del colonialismo verde: Justicia global y geopolítica de las transiciones ecosociales* (pp. 123–145). CLACSO.

Zografos, C., & Robbins, P. (2020). Green sacrifice zones, or why a Green New Deal cannot ignore the cost shifts of just transitions. *One Earth, 3*(5), 543–546. https://doi.org/10.1016/j.oneear.2020.10.012

Ximena Alejandra Tapia Palacios
Universidade de Lisboa | Lisboa | Portugal
https://orcid.org/0009-0009-1676-4041
alejandra.tapia@ics.ulisboa.pt
ximenalejandra.t12@gmail.com

Cientista social especializada en sostenibilidad y transformaciones socio-ecológicas. Tiene licenciaturas en Sociología y Antropología Aplicada y un MSc. in Transition, Innovation and Sustainability Environments. Actualmente es doctorante en Climate Change and Sustainable Development Policies from the Institute of Social Sciences, University of Lisbon. Sus intereses de investigación exploran los impactos del cambio climático sobre los territorios del norte y el sur global.

¿Transición o transformación? Desafiando la "transición ordenada" de la minería verde a través de las experiencias en Portugal y Ecuador desde una perspectiva de puntos de apalancamiento

Resumen

Las agendas globales de descarbonización se basan cada vez más en formas de extractivismo verde, lo que genera complejas tensiones socioambientales tanto en el Norte como en el Sur Global. Este capítulo examina, mediante un análisis comparativo, cómo los proyectos enmarcados como parte de la "transición verde" reconfiguran los sistemas socioecológicos de dos estudios de caso: la región de Barroso en Portugal y los páramos de Río Blanco y Kimsacocha en Ecuador, donde las alianzas entre el Estado y las empresas promueven las llamadas "transiciones ordenadas" centradas en la minería de litio y otros metales. Si bien se presentan como indispensables para la acción climática, estos proyectos revelan profundas contradicciones entre los imperativos de la descarbonización y la sostenibilidad territorial. El capítulo se sitúa en los debates sobre extractivismo verde, ecología política y transformaciones para la sostenibilidad. Desde una perspectiva de sistemas socioecológicos, aplica el marco de puntos de influencia de Donella Meadows para examinar distintos niveles de intervención sistémica, incluyendo parámetros, retroalimentaciones, diseño institucional e intención. Este enfoque metodológico permite analizar de manera estructurada cómo interactúan los arreglos de gobernanza, las narrativas de desarrollo y las experiencias comunitarias en estos nuevos contextos extractivos. A través de un análisis temático comparativo de fuentes documentales y observaciones contextuales, el capítulo describe las configuraciones institucionales, los discursos desarrollistas y las dinámicas territoriales asociadas a estos proyectos. Asimismo, dialoga con enfoques estructurales, sistémicos y habilitadores de transformación para situar los casos en los debates contemporáneos sobre transición y transformación. De este modo, el capítulo contribuye a los debates sobre transición y transformación, destacando cómo la profundidad sistémica moldea las implicaciones políticas y ecológicas del extractivismo verde.

Palabras clave: Extractivismo verde; sostenibilidad; transformación; transición energética; Puntos de influencia.

Transição ou Transformação? Desafiando a "Transição Ordenada" da Mineração Verde a partir das Experiências em Portugal e Equador sob uma Perspectiva de Pontos de Alavancagem

Resumo

As agendas globais de descarbonização estão cada vez mais fundamentadas em formas de extrativismo verde, gerando complexas tensões socioambientais tanto no Norte Global quanto no Sul Global. Este capítulo examina, por meio de uma análise comparativa, como projetos enquadrados como parte da "transição verde" reconfiguram os sistemas socioecológicos de dois estudos de caso: a região de Barroso em Portugal e os páramos de Río Blanco e Kimsacocha no Equador, onde alianças público-privadas promovem as chamadas "transições ordenadas" centradas na mineração de lítio e outros metais. Embora apresentados como indispensáveis para a ação climática, esses projetos revelam profundas contradições entre os imperativos de descarbonização e a sustentabilidade territorial. O capítulo situa esses casos nos debates mais amplos sobre extrativismo verde, ecologia política e transformações para a sustentabilidade. Conceitualmente, baseia-se em uma perspectiva de sistemas socioecológicos e aplica o quadro de pontos de alavancagem de Donella Meadows para explorar diferentes níveis de intervenção sistêmica, incluindo parâmetros, fluxos de retroalimentação, desenho institucional e intencionalidade subjacente. Essa abordagem metodológica permite um exame estruturado de como as estruturas de governança, as narrativas econômicas e as experiências comunitárias interagem em contextos extrativistas emergentes. Também se engaja com discussões teóricas sobre abordagens estruturais, sistêmicas e habilitadoras para a transformação, a fim de situar os casos nos debates acadêmicos em curso sobre transição versus transformação. Ao colocar em diálogo dois contextos geográfica e politicamente distintos, o capítulo contribui para uma compreensão transescalar de como as estratégias de descarbonização se cruzam com as realidades socioambientais locais. Contribui para os debates em andamento sobre transição e transformação, destacando como a profundidade sistêmica molda as implicações políticas e ecológicas do extrativismo verde.

Palavras-chave: Extrativismo verde; sustentabilidade; transformação; transição energética; pontos de alavancagem.