ECOSYSTEMS AND PEOPLE
2025, VOL. 21, NO. 1, 2485282
https://doi.org/10.1080/26395916.2025.2485282

Taylor & Francis
Taylor & Francis Group

RESEARCH

OPEN ACCESS Check for updates

Characterising landscape homogenisation: a qualitative approach based on five case studies

Gonzalo Cortés-Capano [a,b,c], Girma Shumi [d], Kaisa J. Raatikainen [e], Zahra Mahdavi-Nezhad [f] and Jacqueline Loos [g,h]

[a]Department of Agricultural Economics and Rural Development, University of Göttingen, Göttingen, Germany; [b]Faculty of Organic Agricultural Sciences, University of Kassel, Witzenhausen, Germany; [c]Department of Social Sciences and Philosophy, School of Resource Wisdom, University of Jyvaskyla, Jyvaskyla, Finland; [d]Independent Researcher, Lüneburg, Germany; [e]Finnish Environment Institute (Syke), Societal Change Unit, Jyväskylä, Finland; [f]Independent Researcher, Tehran, Iran; [g]Social-Ecological Systems Institute, Faculty of Sustainability, Leuphana University, Lüneburg, Germany; [h]Department of Botany and Biodiversity Research, Faculty of Life Sciences, Vienna University, Vienna, Austria

ABSTRACT

Landscapes are places where multiple social-ecological relations thrive. However, due to intensification of industrial land-uses, they are losing their diversity of species and functions, languages and practices, thereby influencing the ways in which people interact with each other and non-human beings across the globe. A better understanding of such changes in landscapes is necessary to enhance urgent transformative change to overcome the sustainability crisis that humans and non-humans are currently facing. In this article, using an in-depth, reflexive thematic qualitative approach, we characterised landscape homogenisation across five case study landscapes in Ethiopia, Finland, Germany, Iran and Uruguay by a) identifying and describing the main driving forces underpinning landscape homogenisation within each landscape and b) exploring and discussing some of the main relations between different driving forces contributing to landscape homogenisation across landscapes. Four main driving forces characterising and contributing to landscape homogenisation globally emerged from the results: economic growth imperative; industrialised commodity production; rural depopulation; and abandonment of traditional practices. While all forces were observed across all studied landscapes, they took different shapes and ways in each context. We provide an operational conceptualisation of landscape homogenisation, highlight that the loss of landscape heterogeneity is driven by a complex fabric of co-occurring driving forces, and discuss potential constraints for transformative change. Our approach and lessons learned can provide insights to inform action-oriented research in other rural landscapes globally to addressing the interwoven nature of the issues challenging landscapes' sustainability.

KEY POLICY HIGHLIGHTS

- Landscape homogenisation erodes social-ecological diversity across diverse geographies. This systematic loss of heterogeneity constrains possibilities for humans and non-humans to transform and navigate uncertain futures.
- Global economic pressures drive homogenisation while local responses shape the form and the outcomes. Both the impacts of landscapes homogenisation and the ways to address it vary across landscapes, requiring place-based actions.
- Policy interventions must focus on addressing structural dimensions and strengthening local agency. Policies should challenge economic growth imperatives and pervasive subsidies to industrial production while supporting multifunctional practices, plurality of knowledge systems, and transformative change.
- Shift from static conservation to transformative action. Instead of viewing landscapes as heritage sites to be preserved, actions and policies should empower communities as active agents, fostering experimentation and creating enabling conditions for diverse and sustainable rural landscapes.

ARTICLE HISTORY
Received 11 November 2024
Accepted 20 March 2025

EDITED BY
Patrick O'Farrell

KEYWORDS
Biocultural diversity; place-based research; social-ecological systems; transformation; reflexivity; globalisation

1. Introduction

Landscapes are arenas of multiple social-ecological relations. According to Ingold (2000), landscape can be conceived as 'the pattern of dwelling activities', including the array of practices that human and non-human beings carry out in the temporal process of inhabiting their environment, thus shaping and being shaped by the land. From this perspective, the most

CONTACT Gonzalo Cortés-Capano gonzalo.cortescapano@uni-goettingen.de
Supplemental data for this article can be accessed online at https://doi.org/10.1080/26395916.2025.2485282

important factors influencing landscape change are related to ways of inhabiting and using the land. However, many landscapes across the world are experiencing parallel losses in terms of their diversity of species, languages and practices, affecting the ways in which people interact with other humans and non-humans, thereby eroding regional variation within and between landscapes globally (Rozzi 2013; Droz et al. 2023; Levis et al. 2024). These losses are characteristic of the current sustainability crisis and exemplify a complex interconnectedness of ecological, social and economic driving forces co-producing challenges at different dimensions and scales (Fanning et al. 2021). Current challenges include biodiversity loss and climate change, as well as food, health and increasing socio-economic inequality, compromising livelihoods and wellbeing of both current and future generations (Lawrence et al. 2024). Fundamental transformations are urgently needed at different levels to address the underlying global structural forces of change underpinning the sustainability crisis (Feola 2015; Scoones et al. 2020; Patterson et al. 2024). Since global driving forces operate and are experienced differently in specific contexts, a more nuanced understanding of changes at the landscape level is key to support effective, contextually adequate and just transformative change (de Koning et al. 2023). In this article, we examine the process of homogenisation (i.e. the generation of sameness) of rural landscapes through an in-depth qualitative comparison of five case studies located on four continents.

Landscapes are spaces of interacting global and local driving forces of change. There are different conceptualisations of landscape emerging from a variety of academic fields (e.g. geography, anthropology, ecology, architecture). Here, we generally adopt the one from the European Landscape Convention considering the landscape 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (C.O.E. 2000), though the term is occasionally used more broadly in the text. Rural landscapes occupy the vast majority of the Earth's surface. These landscapes are oftentimes composed of agroecosystems interspersed with natural areas and provide livelihoods and food for millions of people worldwide (Woodhill et al. 2022). The ways people have related with other humans, non-humans and with the land, according to their worldviews, values, knowledge and institutions, have shaped such landscapes for generations (Plieninger et al. 2022). Thus, as a result of long histories of co-evolution and co-inhabitation through traditional practices, rural landscapes are often rich and unique in their entangled and mutually constitutive biological and cultural diversity (Maffi 2005; Haider et al. 2021).

In the last decades, the sustainability of many rural landscapes has been increasingly challenged by the impacts of different global to local socio-economic forces, often leading to landscape homogenisation, affecting both their inhabitants and broader social-ecological systems (Díaz et al. 2019; Fischer et al. 2022). Studies from different academic fields, ranging from landscape ecology to the social sciences and the humanities, have unveiled processes of homogenisation leading to a simultaneous decline in native biological and cultural diversity (e.g. Rozzi 2013; Morteo-Montiel et al. 2021; Habel et al. 2023; Linck et al. 2023). This includes the loss of heterogeneity in species and ecosystems, social practices, knowledge and languages, in both rural and urban areas (Rozzi 2013; Lemoine-Rodríguez et al. 2020). A variety of complex causes have been reported to underpin landscape change globally (Assede et al. 2023; Díaz et al. 2019; Piquer-Rodríguez et al. 2018; Plieninger et al. 2016). These causal processes operate at various temporal and spatial scales and have been frequently referred to as drivers or driving forces in landscape ecology and land systems science (Bürgi et al. 2005; Meyfroidt 2016). Driving forces include socio-economic, political, technological, natural and cultural factors, strongly linked through multiple dependencies and feedback loops (Bürgi et al. 2005; Lambin et al. 2001; Plieninger et al. 2016). However, most studies on cultural landscapes have traditionally focused on quantitatively addressing a few dimensions of landscape change, mainly land use/land cover changes and/or land abandonment (Bürgi et al. 2022), often overlooking system feedback, design and intent (see, e.g. Fischer et al. 2022). Although important, these approaches may fail to engage with other relevant social-ecological contextual dimensions of landscapes, such as those related to practices, values and knowledge (e.g. Raatikainen and Barron 2017; Riechers et al. 2020; Bürgi et al. 2022; Chapman and Deplazes-Zemp 2023). Qualitatively engaging with multiple social-ecological dimensions may help reveal how different driving forces may interact in landscapes to co-produce homogenisation.

In this study, we conducted an in-depth, reflexive qualitative approach to: i) identify and describe the main driving forces characterising and contributing to landscape homogenisation within the case studies and ii) explore some of the main relations between different driving forces contributing to landscape homogenisation. To do this, we produced and analysed original narratives of landscape change produced by integrating multiple evidence from five different rural landscapes in Ethiopia, Finland, Germany, Iran and Uruguay. We discuss some of the implications of our findings to inform transformative change contributing to rural landscapes sustainability.

2. Methods

2.1. Philosophical position and operational definitions

We adopted a pragmatist philosophical position, which conceives making sense of the world as inseparable from agency within it, recognising the embeddedness of researchers within the processes of knowledge production (Legg and Hookway 2021). In line with this, we regard knowledge as arising from social and reflexive collaborative processes of concrete problem-solving. In our scientific practices, we nurtured a deliberative, slow and caring collaborative process for over 3 years. We aimed to recognise and engage with diverse worldviews, values, fields of research and methods to make sense of landscape homogenisation to pursue our normative commitment of contributing to sustainability transformations (Cortés-Capano et al. 2022; Ludwig and Ruphy 2021; Zafra-Calvo et al. 2020). We considered changes in landscapes to be discrete and irreversible events, connected to other events to produce causal chains of events (i.e. processes; Walters and Vayda, 2009). We conceived 'driving forces' as recurrent chains of events with typical or hypothetical power to cause observed landscape change through a series of interconnected causal relations (Bürgi et al. 2005; Meyfroidt 2016). Here, we focused on driving forces with some evidence of association with landscape homogenisation.

2.2. Case studies

The study is based on the in-depth analysis and synthesis of five landscapes to enhance analytical generalisability through the construction of accounts (Bartlett and Vavrus 2017). The case study landscapes were Agaro-Gera in Ethiopia, Central Finland, Altmühltal in Germany, Arasbaran in Iran and Laureles-Cañas in Uruguay (Figure 1). Along pragmatist lines, these cases were collaboratively selected by the co-authors to ensure they were rich in information, covered diverse social-ecological contexts and benefited from the contextual expertise of each co-author, enabling a more comprehensive understanding of the phenomena under investigation (Patton 2014). Each landscape was conceived as an open system, related to other places across different ecological (e.g. biome, watershed, ecosystem) and social levels (e.g. administrative, cultural) (Massey 2005; Wylie 2007).

The Agaro-Gera landscapes in Ethiopia are characterised by a diverse mosaic of forest, smallholder farmland (e.g. arable and grazing land, gardens), settlements, wetlands, rivers, undulating slopes, mountains and flat plateaus. The area is the centre of origin and genetic diversity of wild coffee populations of *Coffea arabica*, a shrub that has cultural and economic significance both at local and global levels. The largest ethnic group in the area is the Oromo. The province of Central Finland

Figure 1. Location of the landscapes engaged with in this study to describe the main driving forces characterising landscape homogenisation. Photo credits: Germany: J. Loos; Finland: Wikimedia Commons by Kallerna (CC BY-SA 4.0); Uruguay: G. Cortés-Capano; Ethiopia: G. Shumi; Iran: Zahra Mahdavi-Nezhad.

encompasses a large area characterised by coniferous boreal forests and lake-river systems. The topography was moulded by the retreat of the last continental glacier, leaving behind an undulating relief consisting of ridge formations and peatlands. The main forms of subsistence for the inhabitants have been agriculture and forestry; recently, these land-use practices have intensified, and industrial-scale forestry is considered as the economic backbone of the region. In relation to this, most ecosystems have been impacted by forestry-related practices, leading to considerable changes in the appearance of the landscape and loss of biodiversity in terms of habitats. In Altmühltal, Germany, grasslands have been a significant part of the hilly landscape for centuries. They have covered large areas of this region and have served as important sources of food for animals and places for them to graze. Traditionally, transhumant sheep grazing was the common practice on these partly nutrient-poor, calcareous grasslands on which many nowadays endangered plant, grasshopper and butterfly species occurred. Nowadays, a large part of this region is designated as a 'nature park', with extensive sheep grazing being used as a landscape conservation measure. Arasbaran Biosphere Reserve in Iran, with its rich flora and fauna, is a mountainous region characterised by diverse topography, including deep valleys, high slopes, forests, grasslands and rivers. This region has a rich cultural and historical heritage emerging from thousands of years of human inhabitation. Local populations are mainly rural and nomads who strongly rely on natural resources for economic independence. Agriculture and animal husbandry are their primary livelihoods, and their sustainable practices have allowed them to adapt to the challenging mountainous environment they inhabit. The "Cuchilla de Laureles y Cañas" is characterised by a mosaic of diverse ecosystems, ranging from native grasslands covering ~60% of the area, to sub-tropical forests and shrublands immersed in a rolling topography characterised by hills, rivers and waterfalls. People speak a distinctive dialect ('Uruguayan Fronterizo') and there are traditional legends, folk music, celebrations, skills and local knowledge. The main land use in the area is traditional cattle and sheep ranching on native grasslands. Further details on each case study and references to empirical studies can be found in the Supplementary Material.

2.3. Landscape narratives

To capture how homogenisation takes place in different contexts, we followed a process-oriented approach to case studies, producing an original narrative for each landscape (Bartlett and Vavrus 2017). Following Plieninger et al. 2022, we first co-produced a template narrative for one of the case studies (Laureles-Cañas landscape). The standard structure included: 1- background: general information about the country and the landscape to provide contextual information; 2- main events and dynamics in the landscape: to briefly present historical and recent events and changes within the landscape relevant to homogenisation; 3- main driving forces and conditions contributing to landscape homogenisation and underpinning landscape heterogeneity. This structure was then used to organise the construction of narratives for all case studies. Each narrative (Box 1 for a summary, see Supplementary Material for the full narratives) was prepared by integrating multiple sources of evidence, including peer-reviewed literature, official statistics and accounts of landscape change drawn from interviews, workshops and researchers' experiences. The interviews and workshops were part of previous projects of the authors, involved a range of participants, including local stakeholders and experts, and were designed to capture diverse perspectives. While the narratives were crafted to be internally consistent, they were also flexible across cases in terms of information sources and writing styles. Shared patterns of meaning were derived through thematic analysis of these diverse sources, which were carefully selected based on relevance and quality. This was important to 'move beyond a simple classification of drivers as underlying or proximate towards exploring causalities and contingencies' (Bürgi et al. 2022). Importantly, the narratives did not aim to produce exhaustive accounts of all global to local driving forces and their relations but instead to highlight the main ones for which there is evidence related to landscape homogenisation. All narratives were reviewed by the author team for clarity and consistency before data analysis.

2.4. Data analysis

Narratives were analysed by following a thematic analysis approach to qualitative data analysis that facilitates the identification and analysis of themes in a given dataset (i.e. 'patterns of shared meaning underpinned by a central organising concept'; Braun and Clarke 2013). Themes are analytic outputs actively produced through creative coding by researchers at the intersection of data, analytic process and subjectivity (Byrne 2022). We followed an abductive reasoning orientation for coding and theme construction, involving a parallel engagement with empirical data and with relevant theoretical understanding (Timmermans and Tavory 2022). Abduction is a pragmatist logical mode of inference involving a creative process of forming and evaluating explanatory hypotheses in the absence of a complete set of information (Timmermans and Tavory 2022). It focuses on the explanation of a process, in this case,

Box 1: Summarised narratives of landscape homogenisation in the case study areas.

Agaro-Gera, Ethiopia

The historical legacy of colonialism or feudalism in Agaro-Gera landscapes in the Oromia Region in Ethiopia has perpetuated a regime characterised by the advocacy of uniform modes of livelihood and production under the guise of economic growth. This regime, typically led by individuals or groups with shared interests and mindsets, tend to marginalise, ignore and inferiorise local communities and their indigenous practices, cultures and norms as 'primitive', 'irrational' or 'unproductive'. Such attitudes fuel agricultural expansion and intensification, deforestation, forest and land degradation and urbanisation in the region. This push for economic growth comes at the expense of local people, who are forced to abandon their traditional ecological knowledge, institutions, places and language. This erasure of perspectives and practices restricts the ability of local people to think, work and speak their minds. Moreover, it exacerbates the loss of both ecological and social diversity in the region. Increased corruption and individualism, coupled with issues such as land grabbing, tenure insecurity and unclear property rights, intensify the pressures on local communities in the area, thereby undermining the resilience of ecosystems and social structures, accelerating the homogenisation of landscapes and cultures in Agaro-Gera landscapes.

Central Finland

During the past two centuries, the livelihoods within Central Finland have changed from traditional subsistence farming into industrialised silviculture and agriculture in the rural areas and working in the services sector in the urban and peri-urban areas. This process is reflected in rural depopulation and the disappearance of rural landscapes with high biodiversity and complex social-ecological land-use traditions and practices. The original peatlands of Central Finland have been widely ditched, drained and planted with trees. As a whole, the region is dominated by widespread reforestation with homogeneous plantation forests that are efficiently thinned and harvested to maximise timber production. Adverse impacts on the environment include a decrease in the water quality of lakes and rivers through humus and nutrient run-off and loss of biodiverse wood-pastures and meadows. The remaining farmland is heavily impacted by industrialised agriculture that favours larger farms with higher inputs in monocultural production.

Altmühltal, Germany

The Altmühltal contains a landscape mosaic including forests, juniper heaths, rock formations and calcareous grasslands. Biodiversity in these dry grasslands thrive under the nutrient-poor and fluctuating temperature conditions. Historically used as grazing grounds, their economic viability has declined since the 1950s due to agricultural intensification and global trade. Balancing grazing frequency and stock density is fundamental to maintaining biodiversity. Today, grazing is primarily applied as a conservation strategy in the nature park established in 1969, but strict regulations hinder the recruitment and convincement of herders. Endangered species survival, like the 'Hermit' butterfly *Chazara briseis*, depends on suitable management, but limited funding makes it difficult to maintain appropriate grazing regimes and environmental changes such as atmospheric nutrient deposition and climate change poses challenges to the grasslands, which are slowly becoming dominated by few generalist, competitive grass species, such as *Bromus erectus*.

Arasbaran, Iran

Throughout history, the most significant event for landscape homogenisation in the Arasbaran region has been extensive deforestation. In the past, poverty and deprivation forced indigenous people to rely on trees for various purposes. Moreover, they transformed forests into agricultural and grazing lands for their livelihood. This process has continued until now, and other factors such as mining activities, road construction, energy transmission lines and construction of villas and recreational areas, have intensified the deforestation, fragmentation and loss of natural habitats for plants and animals, subsequently decreasing biodiversity. The advancement of technology, alongside shifting economic practices, has also attracted non-indigenous populations to the region, resulting in increased housing demands and further destruction of natural resources for construction. On the other hand, the transformation of land use with changes in agricultural and pastoralism practices through modern techniques and tools has led the landscape to homogenisation by habitat destruction and the loss of traditional practices.

Laureles-Cañas, Uruguay

Historically, the colonial project in the region, supported by the emerging local elites, led to the hegemony of modernist, productivist discourses and practices, the genocide of indigenous people and the introduction of cattle and private land as ways of organising the landscape. In recent times, the main events associated with landscape homogenisation are: i) land use change, with the increasing replacement of native grasslands to industrial forestry monocultures; ii) rural exodus, with people leaving the area to study and work in cities; iii) shrubland encroachment mainly resulting from land abandonment and the decrease in traditional sheep herding practices. Both as consequences of and reinforcing homogenisation, there has been a gradual abandonment of traditional practices related to cattle ranching and a weakening of the community capacity for collective action and coordination to address social-ecological problems.

landscape homogenisation to then speculate what might have brought it about, reasoning from effects to causes to make sense of complex problems (Walters 2017). Following Braun and Clarke (2013), after familiarising themselves with the narratives, one of the researchers conducted an iterative coding process aiming to identify and interpret patterns of meaning related to landscape homogenisation across the narratives. Initial codes were first organised into sub-themes and then into themes around broad central organising concepts (i.e. relative core commonalities; Byrne 2022). These themes and their relations represented the main driving forces characterising and contributing to landscape homogenisation in the case studies. They were iteratively discussed and reviewed by all co-authors to increase coherence, representativeness and credibility.

3. Results

3.1. Main driving forces characterising and contributing to landscape homogenisation

Our thematic analysis revealed four main driving forces characterising and contributing to landscape homogenisation (Figure 2): i) economic growth imperative; ii) industrialised commodity production; iii) rural depopulation; and iv) abandonment of traditional practices. In the following, we will integrate these with conceptual insights

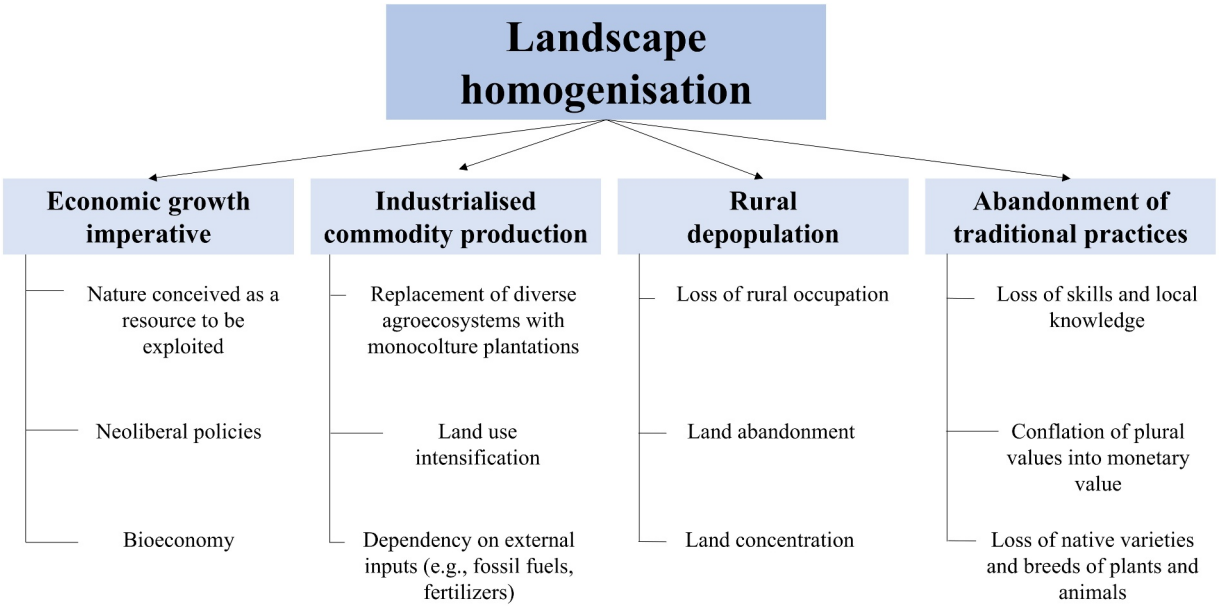

Figure 2. Themes and subthemes illustrating the main driving forces characterising homogenisation in the case study landscapes. In thematic analysis, subthemes share the central organising concept of each theme but further captures nuances or relevant aspects, in this case regarding driving forces.

from the broader literature addressing landscapes and their sustainability, extending beyond the narrative's semantic content.

3.1.1. Economic growth imperative

The central organising concept of this theme focused on the homogenising impacts of both policies and discourses prioritising economic growth as a necessary and sufficient condition to resolve most of the social-ecological problems faced by people inhabiting the landscapes. Main subthemes were related to the adoption of anthropocentric instrumentalist conceptions of nature, the implementation of neoliberal policies and the emergence of new discourses and policies supporting bioeconomy as a win–win solution to climate change and development challenges. While an imperative to economic growth was observed across all case study landscapes, it took different shapes in each context. For example, while in Laureles-Cañas and Agaro-Gera the imperative for economic growth was framed around the necessity for the countries' development processes, in Central Finland it was framed as a solution to the problems experienced by rural communities. In Arasbaran, the imperative for continuous economic growth has led to the increasing exploitation of mineral resources through the establishment of various mines in the landscape. In Central Finland, economic growth has driven the replacement of biodiverse traditional agricultural landscapes by intensively managed farming and forestry landscapes, while in the Altmühltal, this has led to abandonment of the traditional grazing systems.

There was an assumption across the landscapes that nature should be conceived and treated as a resource to serve human purposes. This instrumental view of nature justified substitutability and change of uses following market price fluctuations, as long as it led to the accumulation of financial capital. Another prevalent driving force was the adoption of neoliberal policies by the states to ensure that market forces would maximise land use efficiency and yields. In Uruguay, the state promoted economic growth by investing in and expanding forestry industries through the national forestry law of 1987 (Law 15.939). This law provides tax exemptions and free trade zones to attract multinational corporations and investments to establish operations across the country, including in Laureles-Cañas. In the Agaro-Gera, uniform economic growth strategies, international coffee market prices, REDD+ policies and green growth initiatives have contributed to agricultural intensification and expansion, exacerbating homogenisation. Across the case studies in recent years, there has been an increase in the number and coverage of wind farm plans. Additionally, forest use is increasingly being approached from the bioeconomy and climate change mitigation perspectives. The promise of bioeconomy has directed significant investments in supporting technological innovations to establish a new bioproduct industry based on timber and biofuels. However, these efforts further contribute to landscape homogenisation by promoting the expansion of commercial forestry and crops. Overall, prioritising economic growth fostered industrialisation and commodification of landscapes and their

components, distancing people from their surroundings in terms of livelihoods and everyday place of living.

3.1.2. Industrialised commodity production

This theme suggested that maximising efficient production of commodities through industrialised mechanisations for global trade contributes to landscape homogenisation. The main driving forces (i.e. subthemes) related to the replacement of diverse agroecosystems with monoculture plantations, land use intensification and an increasing dependency on external inputs, including machinery and fossil fuels. The replacement of natural ecosystems, such as forests and wetlands and low-intensity agroecosystems, such as agroforestry, into monoculture plantations designed for commodity production emerged as central to homogenisation across landscapes. Both in Central Finland and in Laureles-Cañas, the most important change in the landscape was the replacement of large extents of biodiversity-rich agroecosystems, such as native peatlands and grasslands, with homogenous tree plantations. In the case of Agaro-Gera, the expansion of the land used for industrially producing commodities, such as tea and coffee, has contributed to deforestation and to the loss of other valuable ecosystems, such as wetlands.

The trend towards intensified land use for global commodity markets has led to landscape homogenisation by expanding the areas covered with homogenous plots, leading to fragmentation, soil degradation, water pollution and biodiversity loss. Such systems depend on chemical fertilisers, pesticides, fossil fuels and credits, which amplifies economic pressures on small family farms. In the Altmühltal, the advent of agricultural industrialisation brought large-scale mechanised harvesting, underpinning intensive agriculture in the region. In Central Finland, land intensification led to increased mechanisation of land use, increasing dependency on fossil fuels and heavy machinery, as well as farm sizes and commodity production volumes. In Agaro-Gera, the dependency of local people also involved external agronomic 'expert advice', eroding local ecological knowledge and practices.

3.1.3. Rural depopulation

This theme was broadly characterised around the central organising concept that people moving off rural areas to live in urban areas contributes to and is a consequence of, landscape homogenisation. The theme emerged from integrating a series of subthemes such as the loss of rural occupations, land abandonment and the concentration of land ownership and access rights. Across the landscapes, rural depopulation was associated with the shrinkage of rural communities' economies and autonomy, typically weakening their capacities for collective action (e.g. low participation in community activities). In both Central Finland and Laureles-Cañas, rural exodus was perceived by local actors to be one of the main pressures threatening the long-term sustainability of the landscapes. In Central Finland, many remote farmsteads have been abandoned, while the remaining agricultural areas have become intensively farmed.

Gradual shifts in the types of occupations considered economically rentable reinforced the lack of opportunities for young people to make a living in the landscapes, particularly in the Altmühltal. Since large industrialised farms usually require a lower number of skilled workers, young people migrate to find jobs in cities or abroad, as is the case for many local people from Agaro-Gera. A decreasing availability of rural schools was reinforced by the decrease and ageing of rural populations, further contributing to landscape homogenisation in Laureles-Cañas. In Central Finland, the abandoned farms and their lands were either sold or remain owned by urban-dwellers who mainly use them as summer houses, while the land is used for forestry purposes. In Altmühltal, rural depopulation and land abandonment contributed to increasing grasslands fragmentation and ecological successions, evolving into new ecosystems protected by nature conservation laws. However, in Agaro-Gera and Arasbaran, land abandonment had minor impacts in the areas, since people remained in the local communities. In Laureles-Cañas, many landowners who leave rural areas sell their properties to industrial forestry companies, contributing to processes of land concentration by large companies that replace native grasslands with commercial tree plantations. Finally, actors in Laureles-Cañas highlighted that people acting as landscape stewards and managing native ecosystems leave the area, resulting in negative impacts on biodiversity.

3.1.4. Abandonment of traditional practices

The central organising concept focused on the loss of traditional practices and how this contributes to landscape homogenisation within and across case studies. Traditional practices are represented by recognisable everyday actions, customary and formal institutions and ways of inhabiting the landscapes. Practices as diverse as transhumant sheep grazing, cattle ranching, slash-and-burn agriculture, hay-making, coffee agroforestry management, hunting and carpet weaving have historically shaped and been shaped by each case study landscape. However, as part of broader trends towards maximising yield and profit, and with people leaving rural areas, many traditional practices are being abandoned. The main subthemes

were organised around insights from theories of practice, highlighting the interconnected: i) loss of skills and local knowledge; ii) loss of biodiversity associated with diverse agroecosystems; and iii) conflation of plural values with the landscape to monetary value. In Arasbaran, key species such as the Caspian Snowcock (*Tetraogallus caspius*), the Caucasian Black Grouse (*Lyrurus mlokosiewiczi*) and the Wild Goat (*Capra aegagrus*) have experienced a significant population decline. These and other species in the landscape are now threatened with extinction mainly due to habitat loss caused by deforestation, road construction and mining activities.

The increasing primacy of monetary value contributed to landscape homogenisation across landscapes. Plural values emerging from relations between people and the landscapes (e.g. sense of place, social cohesion, leisure time in nature) are to social practices and their meaning. However, the conflation of this plurality to monetary exchange values extracted from the landscape undermined the production and social appreciation of other crucial non-commodity public goods and services associated with multifunctionality (e.g. diverse food, water quality, pollination). For example, in Arasbaran, this included the fading of traditional crafts (e.g. carpet weaving and kilim making) and practices (e.g. sheep herding) not considered to be lucrative. Likewise, in Altmühltal sheep grazing turned into an unprofitable activity due to low earnings and far distances to move the herds. Moreover, the transhumance tradition was disrupted by regulations through shifts from common pool resource regimes towards individualised land ownership and biodiversity conservation regulations, prohibiting stayovers within the protected areas. These decreases in grazing practices led to a widespread loss of meadows and wood-pastures in high-nature value grazing systems. Nowadays, herders in the Altmühltal get paid for a conservation service, but the livestock density and grazing intensity insufficiently support the biodiversity that depends on extensively managed grasslands. Similarly, in the case of Laureles-Cañas, a sharp decrease in sheep stock and practices over the last decades contributed to the erosion of skills and values associated with sheep husbandry and wool production as traditional practices in the region. This further contributed to shrubland and forest encroachment and to the increase in exotic invasive plant populations since sheep grazing is more aggressive towards shrubs and tree saplings. In Agaro-Gera, abandoning the Gadaa institution contributed to the loss of multifunctional egalitarian governance systems of the Oromo. This led to the loss of farm and forest customary property and use rights, to the simplification of the plurality of values and relations with nature, and to the loss of multipurpose native species (e.g. *Hygenia abyssinica*, *Olea capensis*).

3.2. Relations between driving forces contributing to landscape homogenisation

Driving forces in the case studies were often fabrics of co-occurring processes, entangled and coproducing each other within and across landscapes. Although expressing in different ways across the case studies, economic growth was framed as a necessary condition for solving most social and ecological problems across all cases. Prioritising economic growth often underpinned industrialised commodity production, responsible for replacing traditional low-intensity land uses with monocultures, ultimately leading to a loss of species, ecosystems and traditional land-use practices. Public policies providing subsidies that support large-scale adoption of commercial inputs in farmlands (e.g. digital transformation, machinery, expert advice, seeds for certain crops), co-produced other driving forces of homogenisation, generating an intertwined network of effects in the landscapes.

In Laureles-Cañas, economic discourses focused on profit maximisation, and national policies (Law 15.939) promoted the establishment of industrial tree plantations. This policy, along with free-trade zones for pulp mills and international trade agreements at the national level, attracted investments to build and consolidate an industrial forestry sector in Uruguay. Many areas in the region have been declared forestry priorities, promoting land use changes from non-forestry-related practices (e.g. traditional, low-intensity cattle ranching) to afforestation with Eucalyptus and Pine. Commercial plantations replaced high biodiversity native grasslands with thousands of hectares of homogeneous monocultures. These plantations contribute to landscape fragmentation and environmental degradation due to the application of agrochemicals, soil erosion and water scarcity. Since industrial plantations occupy large sections of municipal territories, they have become a driving force behind the rural exodus of smallholder farmers, further increasing landscape homogenisation and creating conditions for steady expansion of the sector at the expense of family farms and low intensity social-ecological land-use traditions, practices and knowledge.

The intricate ways through which industrialised commodity production, with loss of rural occupation often underpinned rural depopulation, represented another example illustrating the entanglement of driving forces. In Central Finland, rural depopulation was further amplified with a rapid population growth taking place after World War II. The ‘baby boom’ of

the late 1940s resulted in an excess of working-aged people in the rural areas by the 1960s and eventually strengthened urbanisation, which in turn has placed production demands on the rural areas supporting the cities. Rural depopulation may furthermore pave the way for land concentration and grabbing by multinational companies, which oftentimes homogenise large parts of a landscape through large-scale industrialised commodity production. In combination, rural depopulation and prioritisation of economic growth through industrialised commodity production drives the abandonment of traditional practices. In Agaro-Gera, however, these patterns occur vice versa: the stigmatisation of traditional practices as less developed pushes the prioritisation of economic growth as aspiration for a good life and conceptions of a successful society. Possibly as a consequence of such mindsets, small-scale farmers increasingly associate to agribusiness, thereby furthering their dependence on external inputs. Such co-occurrence of driving forces can lead to emergent dynamics, increasing the intensity, speed or extent of landscape homogenisation in unpredictable ways. However, some of these driving forces also occur in tension, competing for space and time allocations.

4. Discussion

In this study, we investigated the nuances of driving forces underpinning landscape homogenisation across different case studies in Ethiopia, Finland, Germany, Iran and Uruguay. Our novel approach integrated ecological and social perspectives, as well as the authors' experiences to characterise the main driving forces underpinning landscape homogenisation (Bürgi et al. 2022; Van Eetvelde et al. 2024). We found that, despite important geographical and cultural differences between the case studies, landscape homogenisation was primarily driven by common global forces, the growth imperative associated with capitalist economies, the expansion of industrial monocultures, rural depopulation and the abandonment of traditional practices. Each of these driving forces was characterised by chains of causal events ranging from single changes in land use (e.g. local substitutions of grasslands with monocultures) to more stable phenomena (e.g. agricultural policies and market shifts). Driving forces often co-produced each other through feedback loops, leading to path dependencies and lock-ins that might constrain the spaces of possibilities for transformative change. However, rather than assuming linear, deterministic mechanisms through which the global shapes the local, our characterisation of homogenisation emerged from the contingent interplay between multiple global and local forces, conducive to the loss of landscape heterogeneity. This relational characterisation assumes that landscapes are shaped by past events and conditions, leading to multiple possible pathways (Massey 2005; Wylie 2007). Taking into account that global forces are locally produced, reproduced and resisted, this opens spaces for effective political action at different spatial-temporal scales (Massey 2005; Tsing 2005).

Based on our in-depth analysis of multiple sources of evidence, and drawing on foundational concepts of landscape ecology (Noss 1990; Hersperger et al. 2021), we argue that landscape homogenisation can be operationally conceived as a sustained, substantive and observable loss of heterogeneity in landscapes' social-ecological composition, structure and/or function. Composition refers to the diversity of biocultural features, including the diversity of human and non-human actors shaping land use and management. Structure integrates both the spatial and temporal arrangement of cover, land use, governance systems and resource allocation, including the ways humans and non-humans organise their cohabitation in diverse landscapes. Function encompasses the diversity of ecological functions underpinning ecosystem service supply and the plurality of goals, interests and capacities of local actors, shaped by synergies and tensions around claims over nature's contributions to people (Berbés-Blázquez et al. 2016; Neyret et al. 2023). We argue that a comprehensive engagement with these dimensions may provide a lens to understand how homogenisation unfolds indifferent geographies and provide insights for different actors to act in order to adequately address it.

Although expressed in different ways in the case studies, economic growth was often framed as a necessary condition for solving most social and ecological problems across all our studied cases (Brand et al. 2021). Global policies and markets have provided multiple socially relevant benefits in certain landscapes (e.g. biodiversity conservation, water management, climate resilience and the revitalisation of cultural practices; Fagerholm et al. 2020). However, increasing evidence shows that the imperative for continuously expanding the economy degrades biodiversity and compromises social-ecological sustainability due to increasing resource use and inequality (e.g. Otero et al. 2020; Fanning et al. 2021). For example, policies providing subsidies that support large-scale adoption of commercial inputs in farmlands (e.g. digital transformation, machinery, expert advice, seeds for certain crops), might increase small-scale farmers' vulnerability to uncertainty (Nyström et al. 2019; Giraldo and Rosset 2023; Hackfort 2023). In addition, the economic growth imperative often becomes inscribed into social norms, material flows and everyday practices (Brand et al. 2021), generating an intertwined network of homogenising effects in the landscapes.

Our results suggest that, rather than applying general strategies to address homogenisation as a universal phenomenon, future sustainability policies and interventions need to recognise multiple dimensions of landscape homogenisation. This includes engaging with already existing transformative initiatives and with the plurality of values, interests and power dynamics shaping how landscapes are managed to meet inhabitants' needs (e.g. Raatikainen and Barron 2017; Wearne et al. 2023; Loos et al. 2024; Terry et al. 2024). For example, conservation and development policies might provide conditions through a variety of instruments to empower local communities, support heterogeneous patches of land uses and practices underpinning multifunctionality (Cortés-Capano et al. 2021; Loos et al. 2024). At best, such policies might include monetary and non-monetary support to enhance farmers capabilities and social learning (Cortés-Capano et al. 2021), enhancing land tenure security for smallholders (McLain et al. 2021) and ensuring that landscape restoration is implemented in just ways (Ramcilovic-Suominen et al. 2024). However, to avoid adverse outcomes, the development of policies that truly support the maintenance of cultural landscapes should acknowledge the full fabric of social-ecological interactions that fosters biocultural diversity (Raatikainen and Barron 2017). As local communities have limited control over global economic forces, building agency through grassroots movements and landscape stewardship practices may provide opportunities to empower local actors to enhance landscape heterogeneity despite external pressures (Raymond et al. 2016; Robinson and Plieninger 2018).

Among several strategies implemented to enhance landscape sustainability, agroecology has been widely recognised by different actors from academia, social movements and different governmental organisations to simultaneously contribute to food sovereignty, biodiversity conservation and social justice (FAO 2018; HLPE 2019). With origin in peasant and land movements in the global south, they are based on multiplicity, diversity of seeds, knowledge, pollinators, types of food and decentralised markets while actively organising against colonialism and industrialisation (Altieri 2015). Agroecological initiatives typically integrate traditional practices, situated knowledge and skills with socio-technical innovation, recognising the interdependency of natural and cultural dimensions of landscapes (Jeanneret et al. 2021). By reducing dependence on external inputs (e.g. chemical fertilisers, mechanisation), agroecology can reduce farmers' vulnerability to socio-economic and environmental uncertainties (FAO 2018), contributing to resisting agro-industrial production forces driving homogenisation.

Since landscapes are political arenas, efforts to balance existing asymmetries are central to enable diverse actors to participate effectively in shaping landscape sustainability (Loos et al. 2024). For example, in the case of Agaro-Gera, epistemic injustice, a reductionist mindset and the discrimination of Oromo people as 'primitive' were strong driving forces behind homogenisation. This is in line with (Rozzi 2013) who argued that epistemological homogenisation is the basis of biocultural homogenisation, leading in the long-term to the weakening of material, experiential, cognitive and philosophical human – nature connections (Ives et al. 2018). Rather than a simple neutral stage or background for human endeavours, landscapes are the product and outcome of entangled multispecies activities, interpretations and driving forces, retroactively shaping the lives of their inhabitants (Tsing 2005; Wylie 2007; Olwig and Mitchell 2009). Understanding heterogeneity as a value emerging from the expression of a diversity of people's shared cultural and natural heritage implies recognising the significance of landscapes to all, human and non-human inhabitants (Olwig and Mitchell 2009). In practice, this entails critically assessing who gets to decide in each case which dimensions of homogenisation are considered, whether their impacts are considered positively or negatively and for whom and which solutions can be conceived to adequately address it. Overall, it is important to note that our in-depth approach did not aspire to statistical generalisability but to rigorous analytical generalisation, unveiling driving forces which can be further examined in other cases (Patton 2014). In this sense, it is central to continue developing more nuanced, engaged and critical understandings of the ways landscape homogenisation is produced and reproduced, shaping everyday life and constraining possibilities for transformative change.

5. Conclusion

Landscapes and their heterogeneity reflect the multiple ways in which people have inhabited and related to nonhumans and to the land. Systematically reducing landscape heterogeneity can potentially constrain the possibilities available to human and non-human inhabitants to navigate uncertain futures. Our in-depth empirical approach revealed four main driving forces of landscape homogenisation across the studied landscapes: economic growth imperative; industrialised commodity production; rural depopulation; and the abandonment of traditional practices. However, we showed that the interplay of these driving forces can take different shape in different landscapes, highlighting the need for context-dependent approaches to characterise the multiple trajectories of homogenisation. Our operational conceptualisation of landscape homogenisation highlights its entanglement with social-ecological composition, structure and function, contributing to a more nuanced characterisation of the process.

Since there is no single solution to the sustainability crisis, rather than conceiving landscapes as static 'museums' of cultural heritage, we argue that they function as dynamic 'workshops', where communities continuously experiment with ways of living together. Our approach and findings can provide insights to support transformative initiatives and pathways challenging homogenisation and fostering more sustainable rural futures.

Acknowledgements

GC-C is grateful to the Alexander von Humboldt Stiftung for the support through a Postdoctoral Research Fellowship. The work of GC-C and KJR was supported by the School of Resource Wisdom of the University of Jyväskylä.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Alexander von Humboldt-Stiftung.

ORCID

Gonzalo Cortés-Capano http://orcid.org/0000-0002-6714-6560
Girma Shumi http://orcid.org/0000-0001-7386-6815
Kaisa J. Raatikainen http://orcid.org/0000-0002-3099-8962
Jacqueline Loos http://orcid.org/0000-0002-7639-2894

References

Altieri MA. 2015. Breve reseña sobre los orígenes y evolución de la Agroecología en América Latina. Agroecología. 10:7–8.

Assede ESP, Orou H, Biaou SSH, Geldenhuys CJ, Ahononga FC, Chirwa PW. 2023. Understanding drivers of land use and land cover change in Africa: a review. Curr Landsc Ecol Rep. 8(2):62–72. doi: 10.1007/s40823-023-00087-w.

Bartlett L, Vavrus F. 2017. Rethinking case study research: a comparative approach. New York (USA): Routledge.

Berbés-Blázquez M, González JA, Pascual U. 2016. Towards an ecosystem services approach that addresses social power relations. Curr Opin Environ Sustain. 19:134–143. doi: 10.1016/j.cosust.2016.02.003.

Brand U, Muraca B, Pineault É, Sahakian M, Schaffartzik A, Novy A, Streissler C, Haberl H, Asara V, Dietz K, et al. 2021. From planetary to societal boundaries: an argument for collectively defined self-limitation. Sustain Sci Pract Policy. 17(1):264–291. doi: 10.1080/15487733.2021.1940754.

Braun V, Clarke V. 2013. Successful qualitative research: a practical guide for beginners. Los Angeles: SAGE.

Bürgi M, Celio E, Diogo V, Hersperger AM, Kizos T, Lieskovsky J, Pazur R, Plieninger T, Prishchepov AV, Verburg PH. 2022. Advancing the study of driving forces of landscape change. J Land Use Sci. 17(1):540–555. doi: 10.1080/1747423X.2022.2029599.

Bürgi M, Hersperger AM, Schneeberger N. 2005. Driving forces of landscape change - current and new directions. Landsc Ecol. 19(8):857–868. doi: 10.1007/s10980-005-0245-3.

Byrne D. 2022. A worked example of Braun and Clarke's approach to reflexive thematic analysis. Qual Quant. 56 (3):1391–1412. doi: 10.1007/s11135-021-01182-y.

Chapman M, Deplazes-Zemp A. 2023. 'I owe it to the animals': the bidirectionality of Swiss alpine farmers' relational values. People Nat. 5(1):147–161. doi: 10.1002/pan3.10415.

C.O.E. 2000. The European landscape convention [WWW document]. Council of Europe landscape convention. [accessed 9.20.24]. https://www.coe.int/en/web/landscape/the-european-landscape-convention.

Cortés-Capano G, Hanley N, Sheremet O, Hausmann A, Toivonen T, Garibotto-Carton G, Soutullo A, Di Minin E. 2021. Assessing landowners' preferences to inform voluntary private land conservation: the role of non-monetary incentives. Land Use Policy. 109:105626. doi: 10.1016/j.landusepol.2021.105626.

Cortés-Capano G, Hausmann A, Di Minin E, Kortetmäki T. 2022. Ethics in biodiversity conservation: the meaning and importance of pluralism. Biol Conserv. 275:109759. doi: 10.1016/j.biocon.2022.109759.

Cortés-Capano G, Toivonen T, Soutullo A, Fernández A, Dimitriadis C, Garibotto-Carton G, Di Minin E, Aiyadurai A. 2020. Exploring landowners' perceptions, motivations and needs for voluntary conservation in a cultural landscape. People Nat. 2(3):840–855. doi: 10.1002/pan3.10122.

de Koning S, Boezeman D, Kaufmann M, Visseren-Hamakers IJ. 2023. Transformative change for biodiversity: a review on the contribution of landscape-oriented partnerships. Biol Conserv. 277:109858. doi: 10.1016/j.biocon.2022.109858.

Díaz S, Settele J, Brondizio ES, Ngo HT, Agard J, Arneth A, Balvanera P, Brauman KA, Butchart SHM, Chan KMA, et al. 2019. Pervasive human-driven decline of life on Earth points to the need for transformative change. Science. 1327. doi: 10.1126/science.aax3100.

Droz L, Brugnach M, Pascual U. 2023. Multilingualism for pluralising knowledge and decision making about people and nature relationships. People Nat. 5(3):874–884. doi: 10.1002/pan3.10468.

Fagerholm N, Mario BM, Oteros-Rozas E, Lechner AM, Bieling C, Stahl A, Christian O, Raymond CM, Natalie MG, Tobias G. 2020. Perceived contributions of multifunctional landscapes to human well-being: evidence from 13 European sites. People Nat. 1–18. doi: 10.1002/pan3.10067.

Fanning AL, O'Neill DW, Hickel J, Roux N. 2021. The social shortfall and ecological overshoot of nations. Nat Sustain. 5:26–36. doi: 10.1038/s41893-021-00799-z.

FAO. 2018. The 10 elements of agroecology.

Feola G. 2015. Societal transformation in response to global environmental change: a review of emerging concepts. Ambio. 44(5):376–390. doi: 10.1007/s13280-014-0582-z.

Fischer J, Abson DJ, 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. Ecosyst People. 18 (1):119–130. doi: 10.1080/26395916.2022.2032357.

Giraldo OF, Rosset PM. 2023. Emancipatory agroecologies: social and political principles. J Peasant Stud. 50 (3):820–850. doi: 10.1080/03066150.2022.2120808.
Habel JC, Schmitt T, Ulrich W, Gros P, Salcher B, Teucher M. 2023. Landscape homogenisation and simplified butterfly community structure go on par across Northern Austria. Landsc Ecol. 38(12):3237–3248. doi: 10.1007/s10980-023-01785-w.
Hackfort S. 2023. Unlocking sustainability? The power of corporate lock-ins and how they shape digital agriculture in Germany. J Rural Stud. 101:103065. doi: 10.1016/j.jrurstud.2023.103065.
Haider LJ, Schlüter M, Folke C, Reyers B. 2021. Rethinking resilience and development: a coevolutionary perspective. Ambio. 50(7):1304–1312. doi: 10.1007/s13280-020-01485-8.
Hersperger AM, Grădinaru SR, Pierri Daunt AB, Imhof CS, Fan P. 2021. Landscape ecological concepts in planning: review of recent developments. Landsc Ecol. 36 (8):2329–2345. doi: 10.1007/s10980-021-01193-y.
HLPE. 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition (no. 14). HighLevel Panel Of Experts On Food Security And Nutrition (HLPE).
Ingold T. 2000. The perception of the environment: essays on livelihood, dwelling and skill. London, (UK): Routledge.
Ives CD, Abson DJ, von Wehrden H, Dorninger C, Klaniecki K, Fischer J. 2018. Reconnecting with nature for sustainability. Sustain Sci. 13(5):1389–1397. doi: 10.1007/s11625-018-0542-9.
Jeanneret P, Aviron S, Alignier A, Lavigne C, Helfenstein J, Herzog F, Kay S, Petit S. 2021. Agroecology landscapes. Landsc Ecol. 36(8):2235–2257. doi: 10.1007/s10980-021-01248-0.
Lambin EF, Turner BL, Geist HJ, Agbola SB, Angelsen A, Bruce JW, Coomes OT, Dirzo R, Fischer G, Folke C, et al. 2001. The causes of land-use and land-cover change: moving beyond the myths. Glob Environ Change. 11(4):261–269. doi: 10.1016/S0959-3780(01)00007-3.
Lawrence M, Homer-Dixon T, Janzwood S, Rockstöm J, Renn O, Donges JF. 2024. Global polycrisis: the causal mechanisms of crisis entanglement. Glob Sustain. 7:e6. doi: 10.1017/sus.2024.1.
Legg C, Hookway C. 2021. Pragmatism. In: Zalta EN & Nodelman U, editor. The Stanford encyclopedia of philosophy. Winter 2024 Edition. https://plato.stanford.edu/archives/win2024/entries/pragmatism/.
Lemoine-Rodríguez R, Inostroza L, Zepp H. 2020. The global homogenization of urban form. An assessment of 194 cities across time. Landsc Urban Plan. 204:103949. doi: 10.1016/j.landurbplan.2020.103949.
Levis C, Flores BM, Campos-Silva JV, Peroni N, Staal A, Padgurschi MCG, Dorshow W, Moraes B, Schmidt M, Kuikuro TW, et al. 2024. Contributions of human cultures to biodiversity and ecosystem conservation. Nat Ecol Evol. 8 (5):866–879. doi: 10.1038/s41559-024-02356-1.
Linck P, Palomares F, Negrões N, Rossa M, Fonseca C, Couto A, Carvalho J. 2023. Increasing homogeneity of Mediterranean landscapes limits the co-occurrence of mesocarnivores in space and time. Landsc Ecol. 38 (12):3657–3673. doi: 10.1007/s10980-023-01749-0.
Loos J, Cortés-Capano G, Riechers M, Walsh C, Leventon J. 2024. Enhancing the transformative potential of interventions for the sustainable use of natural resources. Biol Conserv. 296:110691. doi: 10.1016/j.biocon.2024.110691.
Ludwig D, Ruphy S. 2021. Scientific Pluralism [WWW Document]. Stanf. Encycl. Philos. [accessed 12.9.21]. https://plato.stanford.edu/entries/scientific-pluralism/.
Maffi L. 2005. LINGUISTIC, CULTURAL, and BIOLOGICAL DIVERSITY. Annu Rev Anthropol. 34:599–617. doi: 10.1146/annurev.anthro.34.081804.120437.
Massey D. 2005. For space. London, (UK): SAGE Publications.
McLain R, Lawry S, Guariguata MR, Reed J. 2021. Toward a tenure-responsive approach to forest landscape restoration: a proposed tenure diagnostic for assessing restoration opportunities. Land Use Policy. 104:103748. doi: 10.1016/j.landusepol.2018.11.053.
Meyfroidt P. 2016. Approaches and terminology for causal analysis in land systems science. J Land Use Sci. 11 (5):501–522. doi: 10.1080/1747423X.2015.1117530.
Morteo-Montiel S, Simms SR, Porter-Bolland L, Bonilla-Moheno M. 2021. Does the simplification of activity systems produce landscape homogenization? Environ Dev Sustain. 23(4):5695–5714. doi: 10.1007/s10668-020-00839-2.
Neyret M, Peter S, Le Provost G, Boch S, Boesing AL, Bullock JM, Hölzel N, Klaus VH, Kleinebecker T, Krauss J, et al. 2023. Landscape management strategies for multifunctionality and social equity. Nat Sustain. 6 (4):391–403. doi: 10.1038/s41893-022-01045-w.
Noss RF. 1990. Indicators for monitoring biodiversity: a hierarchical approach 4. Conserv Biol. 4(4):355–364. doi: 10.1111/j.1523-1739.1990.tb00309.x.
Nyström M, Jouffray J-B, Norström AV, Crona B, Søgaard Jørgensen P, Carpenter SR, Bodin Ö, Galaz V, Folke C. 2019. Anatomy and resilience of the global production ecosystem. Nature. 575(7781):98–108. doi: 10.1038/s41586-019-1712-3.
Olwig KR, Mitchell D, Eds. 2009. Justice, Power and the political landscape. London (UK): Routledge.
Otero I, Farrell KN, Pueyo S, Kallis G, Kehoe L, Haberl H, Plutzar C, Hobson P, García-Márquez J, Rodríguez-Labajos B, et al. 2020. Biodiversity policy beyond economic growth. Conserv Lett. 13:e12713. doi: 10.1111/CONL.12713.
Patterson JJ, Feola G, Kim RE. 2024. Negotiating discord in sustainability transformations. Proc Natl Acad Sci USA. 121(21):e2310186121. doi: 10.1073/pnas.2310186121.
Patton M. 2014. Qualitative research & evaluation methods. 4th ed. Thousand Oaks (USA): SAGE Publications.
Piquer-Rodríguez M, Butsic V, Gärtner P, Macchi L, Baumann M, Gavier Pizarro G, Volante JN, Gasparri IN, Kuemmerle T. 2018. Drivers of agricultural land-use change in the Argentine pampas and Chaco regions. Appl Geogr. 91:111–122. doi: 10.1016/j.apgeog.2018.01.004.
Plieninger T, Abunnasr Y, D'Ambrosio U, Guo T, Kizos T, Kmoch L, Topp E, Varela E. 2022. Biocultural conservation systems in the Mediterranean region: the role of values, rules, and knowledge. Sustain Sci. doi: 10.1007/s11625-022-01155-6.
Plieninger T, Draux H, Fagerholm N, Bieling C, Bürgi M, Kizos T, Kuemmerle T, Primdahl J, Verburg PH. 2016. The driving forces of landscape change in Europe: a systematic review of the evidence. Land Use Policy. 57:204–214. doi: 10.1016/j.landusepol.2016.04.040.
Raatikainen KJ, Barron ES. 2017. Current agri-environmental policies dismiss varied perceptions and discourses on management of traditional rural biotopes. Land Use Policy. 69:564–576. doi: 10.1016/j.landusepol.2017.10.004.
Ramcilovic-Suominen S, Chomba S, Larson AM, Sinclair F. 2024. Decolonial environmental justice in landscape

restoration, in: restoring forests and trees for sustainable development: policies, practices, impacts, and ways forward. New York (USA): Oxford University Press.

Raymond CM, Raymond CM, Bieling C, Fagerholm N, Martin-Lopez B. 2016. The farmer as a landscape steward: comparing local understandings of landscape stewardship, landscape values, and land management actions and land management actions. Ambio. 45(2):173–184. doi: 10.1007/s13280-015-0694-0.

Riechers M, Balázsi Á, Betz L, Jiren TS, Fischer J. 2020. The erosion of relational values resulting from landscape simplification. Landsc Ecol. 35:2601–2612. doi: 10.1007/s10980-020-01012-w.

Robinson GUYM, Plieninger T. 2018. Integrating different understandings of landscape stewardship into the design of agri-environmental schemes. 43:350–358. doi: 10.1017/S037689291600031X.

Rozzi R. 2013. Biocultural ethics: from biocultural homogenization toward biocultural conservation, in: linking ecology and ethics for a changing world: values, philosophy, and action 9–32. Springer Netherlands. 10.1007/978-94-007-7470-4_2.

Scoones I, Stirling A, Abrol D, Atela J, Charli-Joseph L, Eakin H, Ely A, Olsson P, Pereira L, Priya R, et al. 2020. Transformations to sustainability: combining structural, systemic and enabling approaches. Curr Opin Environ Sustain. 42:65–75. doi: 10.1016/j.cosust.2019.12.004.

Terry N, Castro A, Chibwe B, Karuri-Sebina G, Savu C, Pereira L. 2024. Inviting a decolonial praxis for future imaginaries of nature: introducing the entangled time tree. Environ Sci Policy. 151:103615. doi: 10.1016/j.envsci.2023.103615.

Timmermans S, Tavory I. 2022. Data analysis in qualitative research: theorizing with Abductive analysis. Chicago, IL: University of Chicago Press.

Tsing AL. 2005. Friction: an ethnography of global connection. Princeton University Press. 10.2307/j.ctt7s1xk.

Van Eetvelde V, Christensen AA, Hersperger AM. 2024. Social theory and landscape ecology: understanding human agency in the context of landscapes. Landsc Ecol. 39:82. doi: 10.1007/s10980-024-01862-8.

Walters BB. 2017. Explaining rural land use change and reforestation: a causal-historical approach. Land Use Policy. 67:608–624. doi: 10.1016/j.landusepol.2017.07.008.

Walters BB, Vayda AP. 2009. Event ecology, causal historical analysis, and human–environment research. Ann Assoc Am Geogr. 99(3):534–553. doi: 10.1080/00045600902931827.

Wearne S, Hubbard E, Jónás K, Wilke M. 2023. A learning journey into contemporary bioregionalism. People Nat. 5:2124–2140. doi: 10.1002/pan3.10548.

Woodhill J, Kishore A, Njuki J, Jones K, Hasnain S. 2022. Food systems and rural wellbeing: challenges and opportunities. Food Sec. 14(5):1099–1121. doi: 10.1007/s12571-021-01217-0.

Wylie. 2007. Landscape: key ideas in geography. London, (UK): Routledge.

Zafra-Calvo N, Balvanera P, Pascual U, Merçon J, Martín-López B, van Noordwijk M, Mwampamba TH, Lele S, Ifejika Speranza C, Arias-Arévalo P, et al. 2020. Plural valuation of nature for equity and sustainability: insights from the global south. Glob Environ Change. 63:102115. doi: 10.1016/j.gloenvcha.2020.102115.