THEORETICAL DISCUSSION ON LANDSCAPE CHANGE – ATTRIBUTES, PROCESSES, STAKEHOLDERS AND DRIVERS TOWERD SUSTAINABILITY

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ABSTRACT

Landscape change is a dynamic and multifaceted phenomenon driven by complex interactions among socio-economic, environmental, and policy-related factors. This article explores the theoretical underpinnings of landscape change, focusing on the drivers, processes, and implications of these transformations. Drawing on insights from the European Common Agricultural Policy (CAP) and other frameworks, the discussion highlights the interplay between direct and indirect drivers, stakeholders, and policy mechanisms. It synthesizes findings from key reports, scientific literature, and case studies to provide a comprehensive understanding of the processes shaping landscapes in diverse contexts. The article concludes with a critical evaluation of strategies to manage and guide landscape changes towards sustainability.

KEY WORDS: Landscape change, Theoretical discussion, Attributes, Sustainability.

ABSTRAKT

Der Landschaftswandel ist ein dynamisches und vielschichtiges Phänomen, das durch komplexe Wechselwirkungen zwischen sozioökonomischen, ökologischen und politischen Faktoren bedingt ist. Dieser Artikel untersucht die theoretischen Grundlagen des Landschaftswandels und konzentriert sich auf die Triebkräfte, Prozesse und Auswirkungen dieser Veränderungen. Auf der Grundlage von Erkenntnissen aus der Gemeinsamen Europäischen Agrarpolitik (GAP) und anderen Rahmenwerken wird das Zusammenspiel zwischen direkten und indirekten Triebkräften, Interessengruppen und politischen Mechanismen beleuchtet. Er fasst Erkenntnisse aus wichtigen Berichten, wissenschaftlicher Literatur und Fallstudien zusammen, um ein umfassendes Verständnis der Prozesse zu vermitteln, die Landschaften in unterschiedlichen Kontexten prägen. Der Artikel schließt mit einer kritischen Bewertung von Strategien zur Steuerung und Lenkung von Landschaftsveränderungen in Richtung Nachhaltigkeit.

STICHWORTE: Landschaftswandel, theoretische Diskussion, Attribute, Nachhaltigkeit.

RÉSUMÉ

La modification des paysages est un phénomène dynamique et multiforme qui résulte d'interactions complexes entre des facteurs socio-économiques, environnementaux et politiques. Cet article explore les fondements théoriques de la modification des paysages, en se concentrant sur les moteurs, les processus et les implications de ces transformations. S'inspirant de la politique agricole commune européenne (PAC) et d'autres cadres, la discussion met en évidence l'interaction entre les moteurs directs et indirects, les parties prenantes et les mécanismes politiques. Elle synthétise les résultats des principaux rapports, de la littérature scientifique et des études de cas afin de fournir une

compréhension globale des processus qui façonnent les paysages dans divers contextes. L'article se termine par une évaluation critique des stratégies de gestion et d'orientation des changements paysagers vers la durabilité.

MOTS CLÉS: changement de paysage, discussion théorique, attributs, durabilité.

INTRODUCTION

Landscapes are evolving entities shaped by human activities and natural processes. They reflect cultural heritage, ecological functions, and socio-economic dynamics. However, landscapes face increasing pressures from urbanization, agricultural intensification, climate change, and socio-political transformations. Understanding the drivers and processes of landscape change is crucial for managing these changes sustainably and maintaining the ecosystem services landscapes provide. This article investigates the theoretical and empirical dimensions of landscape change, emphasizing the roles of drivers, actors, and policy mechanisms.

RESULTS AND DISCUSSION

A critical review of existing literature reveals the multidimensional nature of landscape change, characterized by a rich interplay between ecological, socio-economic, and political factors. Early studies primarily focused on the ecological consequences of landscape transformations, such as biodiversity loss and habitat fragmentation (Jongman, 2002). However, more recent work has expanded to include socio-economic dimensions, highlighting the role of global trade, urbanization, and agricultural policies in shaping land-use patterns (Klijn, 2004; Haines-Young & Potschin, 2010). The literature also emphasizes the significance of cultural landscapes as a repository of historical and social values, stressing the need for policies that integrate conservation with economic development (Cooper et al., 2009). Despite these advances, gaps remain in understanding the long-term cumulative impacts of policy interventions, particularly in regions experiencing rapid socio-economic transitions. This review underscores the importance of interdisciplinary approaches to address these challenges effectively.

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The intersection of natural and human-induced factors makes landscape changes a multidimensional challenge. Scholars emphasize that landscapes function as "living archives," recording interactions between human culture and the environment over centuries (Klijn, 2004). Addressing this challenge requires an integrated perspective that considers both historical legacies and future aspirations for sustainable land use. This article not only examines the factors driving changes but also evaluates interventions aimed at preserving landscape integrity.

1. DRIVERS OF LANDSCAPE CHANGE

Drivers of landscape change are categorized into direct and indirect influences that operate across various scales, from global to local. These drivers interact in complex ways, influencing landscape structure, composition, and function.

Global Drivers. Global drivers include commodity market fluctuations, energy prices, and climate change. Rising commodity prices incentivize agricultural intensification, altering landscape composition and reducing biodiversity (Klijn, 2004). Conversely, low commodity prices may lead to land abandonment, especially in less productive regions. Climate change exacerbates these dynamics by affecting crop suitability, water availability, and extreme weather events, as observed in Mediterranean regions prone to drought (Herzon & Helenius, 2008).

Beyond these immediate factors, global economic interconnectivity influences landscape decisions, such as the expansion of biofuel crops driven by international energy markets. The demand for renewable energy sources, while environmentally beneficial, can disrupt traditional landscapes by converting mixed-use areas into monocultural plantations (Stoate et al., 2001). Moreover, global trade policies impact agricultural exports and imports, altering local land-use priorities.

The role of international institutions, including the United Nations and the World Bank, in shaping global land use should not be underestimated. Their policies, coupled with development aid programs, influence how landscapes are managed, particularly in developing countries. Case studies from Sub-Saharan Africa reveal the double-edged nature of these policies, which can simultaneously promote sustainable practices and exacerbate resource exploitation.

Continental and Regional Drivers. At the continental level, European Union directives, such as the Habitats Directive and Water Framework Directive, influence landscape management. The CAP plays a pivotal role, driving agricultural intensification, extensification, or abandonment through subsidies and market interventions (Brouwer & Lowe, 2000; Stoate et al., 2001); (Alieva, 2022). Regional economic development, infrastructure expansion, and urbanization further shape landscapes by fragmenting habitats and altering land-use patterns (Jongman, 2002).

The CAP's two-pillar structure—direct payments under Pillar I and rural development programs under Pillar II—creates a dual influence on landscapes. Pillar I often supports large-scale production, while Pillar II incentivizes conservation-friendly practices. This dichotomy has led to uneven impacts, with some regions experiencing significant biodiversity loss due to intensified farming, while others benefit from reforestation and ecological restoration projects (Haines-Young & Potschin, 2010); (Radev et al, 2019); (Alieva, 2022);

Regional disparities in policy implementation add another layer of complexity. For instance, northern European countries prioritize rewilding initiatives, while southern regions focus on preserving traditional farming systems. Understanding these disparities is essential for developing tailored policy interventions.

Local Drivers. Local drivers include farm-level management practices, technological adoption, and socio-cultural factors. Farm size, crop rotation, irrigation systems, and fertilization levels directly influence landscape heterogeneity and ecosystem services (Tscharntke et al., 2005). Social perceptions of landscape value, demand for regional products, and tourism also act as local drivers, encouraging landscape diversification (Lowe et al., 2002); (Nikolov et al., 2012).

Technological advancements, such as precision agriculture, are transforming local landscapes. These technologies optimize resource use but may also exacerbate landscape homogenization. For example, automated machinery favors larger, uninterrupted fields, reducing habitat connectivity.

Conversely, smallholder farms adopting traditional methods often maintain diverse landscapes that support biodiversity.

The role of local governance and community-based organizations cannot be ignored. These entities often mediate between farmers and policymakers, ensuring that local voices are heard. Involving local actors in decision-making processes can increase policy acceptance and effectiveness.

2. ATTRIBUTES OF LANDSCAPE CHANGE

Landscape change encompasses a variety of attributes that reflect its complex and multidimensional nature. These attributes include spatial heterogeneity, temporal dynamics, cultural significance, and ecological resilience. Spatial heterogeneity refers to the variation in landscape features, such as land cover and vegetation, which influence biodiversity and ecosystem functioning (Tscharntke et al., 2005); (Nikolov et al, 2013). Temporal dynamics highlight the changes that occur over time, driven by both natural processes and human activities (Klijn, 2004). Cultural significance is another critical attribute, as landscapes often embody historical and social values, serving as markers of identity and heritage (Cooper et al., 2009). Finally, ecological resilience measures the ability of landscapes to absorb disturbances and maintain functionality, which is particularly relevant in the context of climate change and anthropogenic pressures (Haines-Young & Potschin, 2010). Understanding these attributes is essential for designing effective management strategies that balance ecological, economic, and cultural objectives

3. PROCESSES OF LANDSCAPE CHANGE

Landscape change manifests through five primary processes: land abandonment, intensification, intensification, diversification, and urbanization. Each process has distinct implications for landscape structure and ecosystem services.

Land Abandonment. Land abandonment occurs in marginal areas where agricultural practices are economically unviable. This process often leads to ecological succession, increasing biodiversity in some cases but also causing the loss of cultural landscapes (Haines-Young & Potschin, 2010).

Abandoned lands can become hotspots for invasive species, altering native biodiversity. In Eastern Europe, for example, land abandonment following economic transitions led to shifts in vegetation dynamics, with implications for both conservation and agricultural policies (Herzon & Helenius, 2008). Policies aimed at rewilding or re-cultivating such areas must consider socio-economic and ecological trade-offs.

Agricultural Intensification. Intensification involves increased inputs such as fertilizers and machinery, resulting in larger fields and simplified landscapes. While it enhances productivity, it often reduces biodiversity and ecosystem resilience (Tscharntke et al., 2005).

In highly productive regions, intensification has also led to soil degradation and water resource depletion. Balancing productivity with environmental sustainability requires the integration of agroecological principles, such as intercropping and integrated pest management, into modern farming practices (Stoate et al., 2001).

Extensification and Diversification. Extensification reduces agricultural inputs, promoting semi-natural habitats and landscape heterogeneity. Diversification, including agro-tourism and organic farming, enhances landscape multifunctionality, addressing both economic and ecological goals (Cooper et al., 2009).

Diversification also aligns with growing consumer demand for sustainable products. Organic farming and agri-tourism attract premium markets and generate rural employment, creating economic incentives to preserve traditional landscapes. Case studies from the Mediterranean illustrate how diversified farming systems can mitigate climate change impacts while supporting local economies (Klijn, 2004).

Urbanization and Infrastructure Development. Urban expansion and infrastructure projects fragment landscapes and disrupt ecological networks. These changes are often irreversible, emphasizing the need for sustainable urban planning (Jongman, 2002).

Infrastructure development often prioritizes economic growth over ecological considerations, leading to conflicts between stakeholders. Strategic environmental assessments (SEAs) and participatory planning frameworks can help mediate these conflicts by integrating diverse perspectives into decision-making processes (Herzon & Helenius, 2008).

Urban sprawl presents additional challenges, such as increased greenhouse gas emissions and loss of arable land. Compact city models and green infrastructure planning are emerging as viable solutions to mitigate these impacts.

4. POLICY MECHANISMS AND LANDSCAPE MANAGEMENT.

Policy frameworks significantly influence landscape change, with the CAP being a critical example. This section discusses the mechanisms through which policies shape landscapes, focusing on regulatory, economic, and informational instruments.

Regulatory Instruments. Regulations, such as spatial planning and environmental impact assessments, guide land use and resource management. The EU's Natura 2000 network illustrates the use of zoning to protect ecologically valuable landscapes (Herzon & Helenius, 2008).

Beyond traditional zoning, adaptive governance frameworks are emerging as tools to address the complexities of landscape management. These frameworks prioritize flexibility and stakeholder collaboration, enabling policies to adapt to socio-ecological changes (Haines-Young & Potschin, 2010).

Economic Instruments. Subsidies and payments for ecosystem services (PES) incentivize sustainable practices. Agri-environmental schemes under the CAP exemplify this approach, rewarding farmers for biodiversity-friendly practices (Stoate et al., 2001).

Market-based instruments, such as carbon credits, are increasingly relevant for landscape management. By monetizing ecosystem services, these instruments encourage private investments in conservation and restoration projects (Klijn, 2004).

Informational Instruments. Knowledge transfer and capacity-building initiatives enhance policy uptake. Advisory services, training programs, and participatory approaches foster awareness and collaboration among stakeholders (Haines-Young & Potschin, 2010).

Digital platforms and decision-support tools are transforming how information is disseminated. These technologies enable real-time monitoring of landscape changes and facilitate data-driven decision-making, bridging the gap between research and practice.

5. STAKEHOLDERS OF LANDSCAPE CHANGE

The multiplicity of actors involved in landscape change reflects the complexity of its drivers and processes. These actors include policymakers, farmers, non-governmental organizations (NGOs), and local communities.

Policymakers. National and EU-level policymakers design and implement regulatory and economic instruments. Their decisions shape the incentives and constraints influencing landscape management (Brouwer & Lowe, 2000).

Policymakers must navigate competing interests and limited resources. Integrating landscape considerations into broader policy agendas, such as climate action and rural development, can enhance policy coherence and effectiveness (Lowe et al., 2002).

Farmers and Land Managers

Farmers are central actors in implementing landscape management practices. Their decisions are shaped by economic viability, policy incentives, and personal values (Cooper et al., 2009).

Capacity-building programs that empower farmers with sustainable management skills can increase policy uptake. Additionally, recognizing farmers as custodians of cultural heritage can foster a sense of stewardship, encouraging long-term commitments to landscape preservation.

6. NGOs and Civil Society

NGOs advocate for biodiversity conservation and sustainable practices. They often mediate between policymakers and local communities, ensuring stakeholder engagement (Stoate et al., 2001).

Civil society organizations play a crucial role in monitoring policy impacts and holding decision-makers accountable. Collaborative platforms that integrate NGO expertise into policy design can enhance governance transparency and inclusivity.

Local Communities. Local communities contribute to landscape valorization through cultural practices, tourism, and grassroots initiatives. Their involvement is crucial for the long-term sustainability of landscape policies (Herzon & Helenius, 2008).

Community-led conservation initiatives, such as heritage trails and eco-villages, demonstrate the potential of bottom-up approaches. These initiatives not only preserve landscapes but also foster social cohesion and local identity.

SYNTHESIS AND RECOMMENDATIONS. Effective management of landscape change requires an integrated approach that balances ecological, economic, and social objectives. Key recommendations include:

- **Policy Coherence**: Align agricultural, environmental, and spatial planning policies to address conflicting objectives.
- **Stakeholder Engagement**: Foster participatory decision-making to incorporate diverse perspectives.
- **Adaptive Management**: Develop flexible policies that can respond to changing socio-ecological conditions.
- **Research and Monitoring**: Invest in long-term studies to evaluate policy impacts and guide future interventions.
- **Innovative Financing**: Explore market-based instruments, such as PES and carbon credits, to attract private investments in landscape conservation.
- **Education and Awareness**: Promote environmental education to cultivate a culture of sustainability.

CONCLUSION

Landscape change is a multidimensional phenomenon influenced by a web of interacting drivers and processes. By understanding these dynamics, policymakers and stakeholders can develop strategies to manage landscapes sustainably. The insights provided in this article contribute to a deeper theoretical understanding and practical framework for addressing the challenges of landscape change.

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