

What do stakeholders want from multifunctional forest landscapes and can bottom-up collaborations help them to get it?

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ABSTRACT

Policies addressing climate change, biodiversity loss, and rural development are driving the transition towards multifunctional forest landscapes (MFLs) across Europe and beyond. MFLs are interdependent social-ecological systems that integrate diverse human uses and ecological functions to fulfil ecological, socio-cultural, and economic interests.

A significant challenge in developing MFLs is the perceived incompatibility among stakeholder interests. Collaborative approaches are often proposed to negotiate trade-offs and resolve conflicts over competing forest uses. However, fostering effective dialogue remains difficult in contested landscapes. There is a pressing need to understand the desired goods, services, and values that various stakeholder groups seek from MFLs.

This study employs a complex systems approach to identify key themes and factors influencing stakeholder perceptions of MFLs, drawing on focus groups and interviews with diverse participants in a collaborative initiative in the Tiveden forest massif, Sweden. Using the Social-Ecological Systems Framework, we analyse these themes in relation to the biophysical and socio-political components that characterise natural resource management systems. Our findings indicate that conflicting economic functions are vital for the wellbeing of local communities and businesses, alongside efforts to resolve these conflicts. While the findings suggest opportunities for bottom-up initiatives for MFLs, significant constraints persist, including the negative impacts of conventional forestry practices, lack of trust among stakeholders, and critical knowledge gaps. Additionally, our study highlights power asymmetries in forest governance, underscoring the need for systemic changes to facilitate the transition towards MFLs. These findings contribute to the discourse on sustainable forest management and offer valuable lessons for similar efforts in diverse contexts.

1. Introduction

The growing portfolio of desired products and services associated with forest landscapes is driving a desired shift towards approaches capable of securing multiple goods, functions and values in forest stands and landscapes (Kaljonen et al., 2007; McDermott et al., 2024; Pülzl et al., 2024). International policy instruments (e.g., Montreal process, European Landscape Convention, EU Habitats directive, European Green Deal, European Forest Strategy for 2030) increasingly support the development of multifunctional forest landscapes (MFLs). At national levels, for example in the Nordic countries, current policies also nominally support a transition towards MFLs by promoting a combination of recreational use, biodiversity, and diverse forest management methods (Nebasifu et al., 2025). However, such policies have been criticized for

an overly optimistic view that existing resources can be increased to produce “more of everything” from forests (Lindahl et al., 2017), for retaining focus on the instrumental value of forests (Pülzl et al., 2024), and for reducing multifunctionality to an empty formula for enabling consensus (Suda and Pukall, 2014).

MFLs may be characterized as interdependent social-ecological systems that aim at integrating human production-oriented forest uses with forest ecological patterns and processes (Naveh, 2001; O’Farrell and Anderson, 2010). Although forest multifunctionality can be considered in terms of individual forest stands fulfilling multiple simultaneous ecological, economic and socio-cultural functions, at the landscape level it describes patterns of organized and coordinated specialization where different stands and areas in forest management units and entire landscapes are dedicated to different functions (Führer, 2000; Himes et al.,

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2022; Nijnik et al., 2010). This typically includes elements that concurrently serve important ecological, economic and socio-cultural interests, and thereby implies the need to integrate multiple values, knowledge systems and management practices (Godtman Kling et al., 2019; Puettmann et al., 2015).

A key challenge for developing MFLs lies in the perceived incompatibility of different stakeholder interests (Bonsu et al., 2019; Godtman Kling et al., 2019; Sayer et al., 2015). Conflicting interests in forest landscapes are typically managed through contest competition, negotiations and/or difficult trade-offs resulting in one or few hegemonic uses, for example relating to economic production of wood, or biodiversity conservation (e.g., Fredman et al., 2023; Pohjanmies et al., 2017). A shift towards MFLs, however, implies a need to satisfy stakeholder groups who desire competing functions and benefits from the same forest landscape and whose positions are often already polarized (e.g., Elands and Wiersum, 2001; Lorenzini and Von Jacobi, 2024). These opposing positions are increasingly shaped in response to new policies addressing measures supporting adaptation to and mitigation of climate change, renewable energy, conservation of biodiversity including species, habitat and processes affecting resilience, and to promote rural development (Elbakidze et al., 2018; Elsasser et al., 2021; Püzl et al., 2024).

Landscape governance is therefore often messy and cannot be centrally steered (Van Oosten et al., 2021). Stakeholder collaborations, including bottom-up elements, are argued as crucial to overcome contested issues and identify mutually acceptable solutions requiring a shared understanding of the diversity of stakeholder perceptions, the desired functions of the landscape, and up-to-date knowledge concerning the states and trends in these functions (e.g., Nebasifu et al., 2025; Winkel et al., 2022). However, collaborative initiatives often incorrectly assume that the underlying set of problems are self-evident to all parties (Adams et al., 2003). Evidence-based learning and dialogue is therefore necessary to ensure effective policy design and comprehensive planning processes capable of integrating multiple functions in a landscape (Nijnik et al., 2019; Parrott et al., 2019). Such dialogue is difficult because of conflicting interests and power inequalities among different groups, the inherent interdependence of many forest functions and the lack of a common set of defined terms to discuss issues with (Elbakidze et al., 2022; Vermunt et al., 2020). Moreover, bottom-up collaborations may implicitly reflect a broader symbolic struggle for social and political recognition concerning the legitimacy of entitlement to forest landscape resources (Lorenzini and Von Jacobi, 2024). In Europe, these struggles unfold within forest regimes that have been shaped by long histories of intensive, production-oriented forestry, strong state and corporate ownership, and the systematic privileging of “rational” timber management over Indigenous and local land-use practices (e.g., Brännström, 2024; Össbo, 2025).

Scholarship on transformative environmental and forest governance highlights that addressing such entrenched structures requires institutional arrangements that can actively manage and even trigger regime shifts in coupled social–ecological systems, rather than only accommodating incremental change (Chaffin et al., 2016). Core principles include creating conditions for multifunctional interventions that address the interconnectedness of ecological and societal needs, and building broad, equitable coalitions of support that engage diverse local actors in community-led, multi-actor governance processes (Bamidele, 2025; Pascual et al., 2022). These coalitions depend on path-dependent power relations within pre-existing social structures, which stresses the importance of attending to often invisible, fragmented bottom-up alliances around alternative visions and practices if new institutional arrangements are to avoid reproducing existing power asymmetries (Bastiaensen et al., 2021).

Empirical research has documented the diverse and often conflicting perspectives of different groups, especially local stakeholders, and what they actually want from forests (e.g., Elbakidze et al., 2017; Konczal et al., 2025; Richnau et al., 2013), albeit to a much lesser degree in

relation to MFLs specifically (e.g., Bonsu et al., 2019; Meyer and Schulz, 2017). Understanding and balancing these perspectives is a challenge for the realisation of ambitious global and European forest policies, particularly in countries and regions with a long history of intensive even-aged rotation forestry as the dominant forest use (Arnould et al., 2022; Ekström et al., 2024a; Kleinschmit et al., 2024a; Nebasifu et al., 2025). Recent studies nevertheless point to several persistent gaps. In general, few qualitative, place-based studies have investigated social and contextual factors affecting collaborative relationships in MFLs (Cockburn et al., 2019). In particular, while the literature is rich in collaborative management theories, there is a need for more case studies that cover multiple levels of governance and societal contexts (Angelstam et al., 2019a; Elbakidze et al., 2010), and practical examples to demonstrate how collaborative approaches can be effectively implemented in diverse contexts (Cockburn et al., 2019; Whitman et al., 2025). Collaborative initiatives in multifunctional, contested landscapes often underreport power imbalances and social or institutional outcomes, obscuring how equity and recognition are negotiated in practice (Blicharska et al., 2012; Cockburn et al., 2018, 2019; Shiri et al., 2025). Furthermore, the incorporation of a more diverse range of ecosystem services into pre-existing forest management systems requires a deeper understanding of system interlinkages and decision-making processes, highlighting the importance of a holistic, causal approach for understanding the governance and management of MFLs (Bastiaensen et al., 2021; Cockburn et al., 2018). Such an approach is critical for identifying both internal contradictions and strategic opportunities within governance arrangements (e.g., Cavana and Maani, 2000). Despite this, many studies lack systematic analytical frameworks for synthesising complex social–ecological feedbacks, and give limited attention to the dynamic contextual, political–historical and social–relational factors that mediate collaboration and stewardship in place-based settings (Cockburn et al., 2019; Shiri et al., 2025).

This paper speaks directly to these concerns by empirically unpacking how a state-dominated, extraction-oriented regime constrains and shapes bottom-up collaborative initiatives for multifunctionality. Using a holistic, causal approach to identify core themes and key factors among stakeholder perspectives, we examine how bottom-up coalitions may emerge in such contexts, how power asymmetries shape their room for manoeuvre or lack thereof, and what kinds of governance levers might enable more transformative trajectories in MFLs. We focus on a case study in southern central Sweden as a prime example of a landscape with strong legacies of maximum sustained yield wood production (Angelstam et al., 2022), where a collaborative initiative for knowledge production and joint learning towards a multifunctional forest landscape has developed in recent years (Angelstam, 2019; Angelstam and Dawson, 2025). Situated in and around Tiveden National Park, the case study landscape exemplifies a core conflict that arises in many intensively managed forest regions in Europe and elsewhere between the need to protect core areas of high-value forests and the pressures of surrounding land use. The challenges of organizing collective action among diverse stakeholder groups in Tiveden reflect broader governance dilemmas, where internal organization and bargaining strategies are essential for managing contested forest resources (e.g., Lorenzini and Von Jacobi, 2024). This case therefore provides an in-depth, theory-informed litmus test concerning transitions towards MFLs in intensive management contexts. Our research questions are 1) What values do different stakeholder groups perceive to be important in the context of MFLs? 2) What factors are perceived as influencing identified values, and how are these factors understood by stakeholders in relation to the complexity of forests as a social–ecological system? 3) What constraints and opportunities do stakeholders identify concerning a transition towards MFLs, particularly within contexts dominated by industrial forest management? Our discussion of the main findings is structured to inform the development of bottom-up collaborations as a governance lever for MFLs in analogous contexts facing conflicts between industrial wood production, social and

ecological priorities and thereby contributes to the broader discourse on constraints and opportunities for carrying out sustainable forest management in Europe and beyond. The paper's core novelty lies in using an empirically grounded, holistic causal-network approach combined with the Social-Ecological Systems Framework to diagnose how interconnected social, ecological, economic and institutional factors shape bottom-up collaborations for MFLs in an intensive forestry setting. The long-running Tiveden collaboration initiative adds a rare, in-depth example of exploring how multi-actor coalitions may develop innovative governance solutions to negotiate landscape multifunctionality, namely through pioneering a mixed-use buffer zone around a protected area.

2. Analytical framework

Forest governance initiatives emerge from the interplay between the biophysical landscape, the agency of heterogeneous actors – each with their own portfolios of values, objectives, knowledge systems and decision-making processes – and governance structures across multiple spatial and temporal scales (e.g., Dawson, 2019; Deuffic et al., 2018; Eriksson and Fries, 2021). Moreover, these dynamics are embedded in interrelated causal structures composed of multiple institutional, economic, technological, demographic, socio-cultural, and biophysical drivers (Elbakidze et al., 2018, 2022). This inherent complexity necessitates the adoption of an empirically grounded, holistic approach and the use of robust analytical tools capable of integrating diverse stakeholder perspectives and values, and investigating the systemic properties, contexts, histories, and direct and indirect causal mechanisms that underpin these perspectives (e.g., Cilliers et al., 2013; Ekström et al., 2024b; Emerson et al., 2011; Folke et al., 2002; Plummer and Armitage, 2007).

We therefore adopt a holistic, causal approach based on an understanding of forest landscapes as complex social-ecological systems to guide our analysis. This enables us to explore how different stakeholder groups perceive the multifunctional roles of forest landscapes, and the factors influencing these perceptions (e.g., Dawson, 2019; Elbakidze et al., 2022). We employ an inductive, data-driven approach to investigate the potential interconnectedness of a broad range of stakeholders and their interests, thereby enhancing understanding of the fundamental dynamics at play in the development of MFLs. By focusing our analysis on the causal statements that participants make when discussing what is important to their wellbeing and their community, we can effectively capture and integrate a diverse array of variables into a network framework and apply network statistics to identify key factors influencing stakeholder perceptions. This approach combines qualitative and quantitative methods facilitate a more nuanced understanding of the interrelated and emergent nature of forest governance processes.

We subsequently apply the Social-Ecological Systems Framework (SESF) (Ostrom, 2009) to situate and understand the outputs of our network analysis within an overarching system perspective concerning collaborative natural resource governance. The SESF is explicitly designed as a diagnostic, multi-tier framework for analysing how interacting social and ecological variables shape governance outcomes in coupled systems, particularly in commons-like settings such as contested MFLs. In our case, this diagnostic role is particularly relevant because our research questions concern how resource system characteristics, actor attributes and governance arrangements jointly shape stakeholder perceptions and collaboration outcomes. The SESF is structured into tiers of nested and related concepts and variables, which offer a common taxonomy of essential components and relationships to organise stakeholder-derived causal factors across resource, actor, governance, interaction and outcome dimensions, enabling us to connect micro-level perceptions to meso-level institutional and biophysical dynamics (McGinnis and Ostrom, 2014; Partelow, 2018). The framework's recognized flexibility for mixed-method, single-case diagnostics allows us to combine an inductive causal-network analysis with

comparative categories that are widely applied in different contexts to diagnose a variety of sustainability and collaboration challenges, including forest governance and management systems. For example, Govigli et al. (2021) use the SESF to reconstruct three centuries of social-ecological change and collective action in a Greek sacred forest, showing how shifts in actor constellations and governance arrangements affected forest conservation over time. Kar et al. (2025) apply the framework to contemporary forest governance, systematically coding actors, rules, and resource characteristics to diagnose how particular combinations of property-rights, institutional settings and stakeholder attributes shape conflicts and the delivery of multiple forest benefits in rural India. Luo et al. (2024) employ the SESF to link forest policy instruments and governance structures to on-the-ground management practices and social-ecological outcomes, highlighting how demographic trends and environmental regulatory policies have influenced shifts in forest resource utilization at the village level in rural China.

In our analysis, we categorize identified factors according to the first-tier components of the SESF. These include six endogenous and two exogenous components (Fig. 1). Endogenous components concern biophysical factors relating to the forest landscape as a *resource system* and of the specific *resource units* within that system (e.g., forest stands, individual trees, lakes); social system factors concern the *governance system* regulating use of the resource system through development of operational, collective choice, and constitutional rules, and the *actors* directly and indirectly implicated or impacted by its use; the focal action situation, which in our case concerned a collaborative forest landscape governance initiative to support a transition from intensive forest management towards a more multifunctional forest landscape, concerns *interactions* between actors and between actors and the resource system, and (desired) *outcomes*. Importantly, the boundaries around these components are conceptualized as radically open, meaning that system dynamics are influenced by, and may influence, external factors across various spatial scales and governance levels. The framework therefore identifies two main exogenous components concerning the *social, economic, and political settings* and *related ecosystem* factors.

We operationalise this theoretical framework through research design, data collection, data analysis and as a critical lens through which to understand the outputs of our analysis in relation to our research questions. The combination of stakeholder-derived causal networks with SESF-based categorisation allows a system-wide diagnostic of governance constraints and opportunities in the Tiveden transition context. This approach not only enhances understanding of the dynamics at play in the development of multifunctional landscapes but also facilitates comparisons with similar research in other forest contexts and contributes to the evolving discourse concerning the need to engage with the complexity of forest governance issues (Kleinschmit et al., 2024).

3. Methodology

3.1. Data collection

3.1.1. Case study landscape

Across Europe, the intensification and mechanization of the forestry industry towards optimised wood production has led to job losses in rural areas and increased urban migration (e.g., Keskitalo and Lundmark, 2009). This long-term trend has left many European forest landscapes with dwindling populations characterized by demographic imbalances, particularly a relative lack of young people and women, and concomitant reductions in available services and employment options (e.g., Jordbruksverket, 2014). In addition, a societal shift towards a post-industrial service-based economy has transformed people's primary relationship with forest from livelihood to recreation (Helseth et al., 2022). Consequently, the natural and cultural values associated with forests have become key selling points for attracting urban people back into rural landscapes, e.g., through nature-based tourism, amenity migration and peri-urban distance work (Hedberg and Haandrikman,

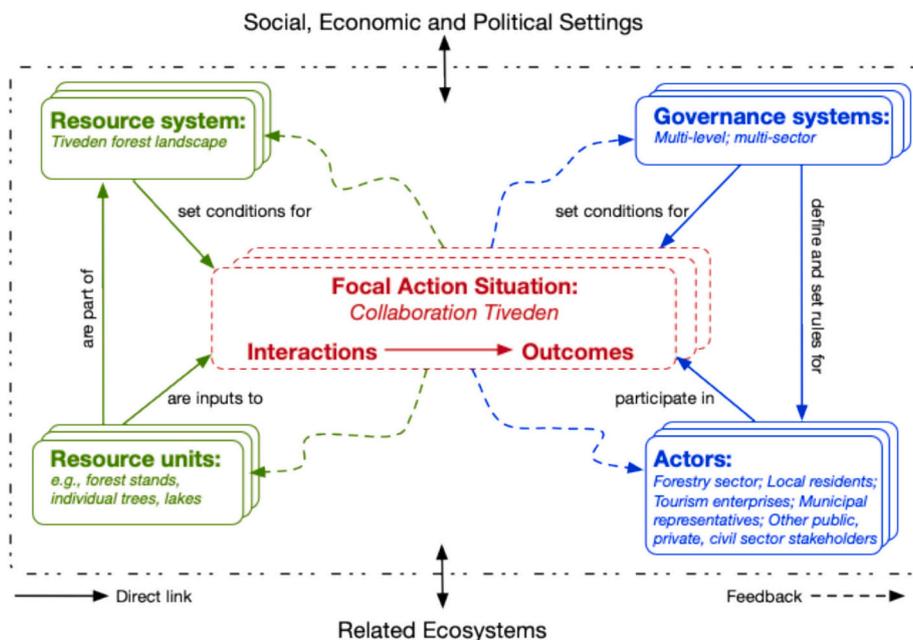


Fig. 1. Conceptualisation of the first tier components of the Social-Ecological Systems Framework (SESF), including their main interactions, and its application in the studied case; adapted from McGinnis and Ostrom, 2014.

2014; Angelstam et al., 2023).

Hosting only 0.7% of the world's forest area, Sweden is nevertheless the fourth largest exporter of combined sawn soft-wood, pulp, paper, and board products in the world after Canada, Russia and USA (Naumburg, 2024). Similar to several heavily forested nations, Sweden's forest sector is characterized by entrenched conflicts between the forestry industry and a growing range of diverse stakeholders (e.g., Angelstam et al., 2023; Elbakidze et al., 2022), including environmental NGOs and actors from the country's burgeoning nature-based tourism sector, for whom Sweden's remaining high conservation value forests are a vital resource. Non-economic values of forests have also become increasingly important to many of Sweden's > 300,000 non-industrial private forest owners, whose holdings are generally small, and who are increasingly comprised by urban residents and women (<https://www.skogsstyrelsen.se/statistik/>). However, recent policy developments indicate continued focus on wood production above other forest values (Swedish Government, 2024), highlighting the continued

difficulties of implementing MFLs in Sweden as well as internationally (Hertog et al., 2022a; Nebasifu et al., 2024; Nikolakis and Innes, 2020).

We conduct a single case study, allowing in-depth place-based exploration of a specific bounded system (Stake, 1995). Such approaches are linked with better understanding of multifunctionality and the role of landscape to support multiple ecosystem services (Blicharska et al., 2020; Potschin and Haines-Young, 2013). We selected the Tiveden forest massif, located largely in the municipality of Laxå in the historic Bergslagen mining region, as a landscape that represents the long history of intensive wood production with small remnant patches of near-natural forest of importance for biodiversity conservation and outdoor recreation (Angelstam et al., 2023). Even-aged rotation forestry based on clearfelling, planting, clearing and thinning, which has been the norm for >150 years in Tiveden, exemplifies this development. Following the decline of iron-based industries, forestry for timber and pulpwood became predominant. However, Laxå municipality (737 km²) has experienced a significant population decline since the 1970s (Fig. 2),

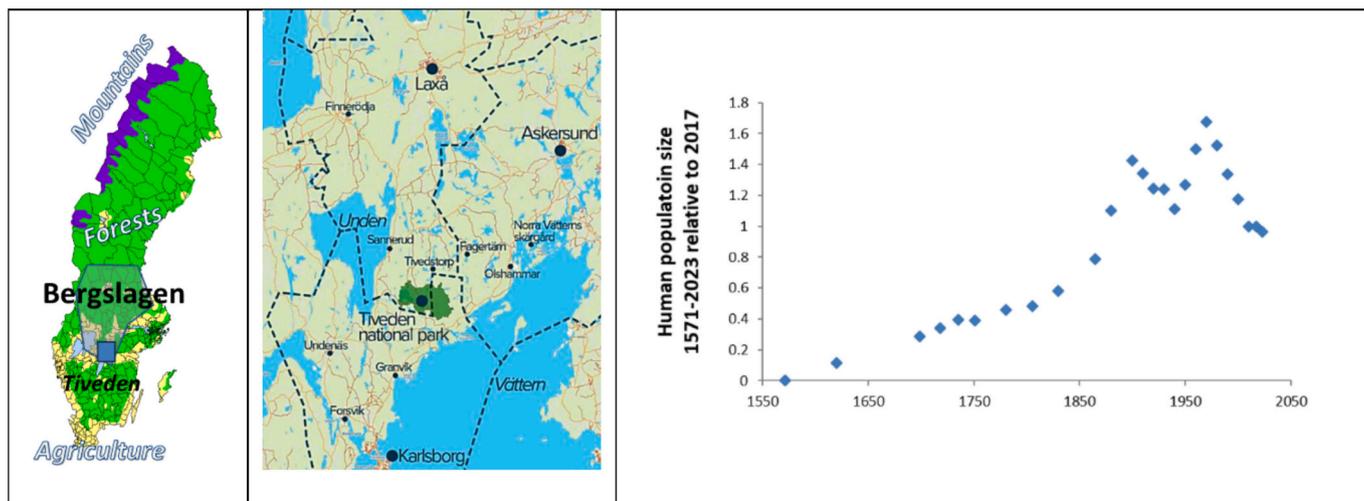


Fig. 2. Map of Sweden and the Tiveden area with its three municipalities Laxå, Karlsborg and Askersund (left), and human population development in the core municipality Laxå (right) 1571–2023 relative to 2017 with 5695 inhabitants (data from Andersson Palm (2000) and Statistics Sweden).

resulting in reduced public services, especially in rural areas like Tiveden. This led to the nomination of Tiveden as one of 23 areas of national interest for outdoor recreation and tourism (SOU 1973:52). Many permanent residences were converted into holiday homes during the late 20th century. Today, Laxå benefits from its proximity to the regional capital Örebro, its rich forest landscapes, including Tiveden National Park, which attracts approximately 120,000 visitors annually, and a burgeoning hospitality sector. These factors have contributed to an influx of post-modern professionals (Jakobsson, 2009).

3.1.2. Focus groups and interviews

We conducted digitally recorded open-ended focus groups and interviews (Flick, 2023) from the establishment of the ‘‘Collaboration Tiveden’’ network in 2016 until 2023. Using snowball sampling (Flick, 2023), we selected a total of 63 participants (21 women and 42 men) representing key actors and stakeholders across public, private and civil sectors – including service providers, tourism firms, foresters, farmers, municipalities, local communities, and NGOs from local to national levels (Table 1). We continued sampling new participants iteratively until we achieved thematic saturation and all key actor and stakeholder categories were adequately represented. Additionally, we conducted repeated expert interviews with core group members of ‘‘Collaboration Tiveden’’ and made participatory observations during biannual core group meetings from 2016 to 2023. Given our focus on the Tiveden forest landscape, the majority of selected participants were from the local level, which is where the most significant interactions and impacts were assumed to occur. While we only selected four participants from the national level, these individuals included major forestry actors and a national nature-based tourism NGO, ensuring that a variety of critical national perspectives were included.

We initiated discussions with a broad, open-ended question: ‘‘What factors are important for your well-being and for firms and local communities in and around Tiveden’s forest landscape?’’ This question served as a starting point for participants to express their views freely. Subsequent discussions lasted 1–2.5 h and were largely unstructured, allowing participants to elaborate on their responses, with facilitators employing probing techniques to encourage deeper exploration of complex issues (Flick, 2023). In the focus groups, participants engaged with one another, often probing each other’s responses, while facilitators observed and took notes. This approach was chosen to facilitate rich, detailed narratives from participants, an open exchange of ideas and to capture the diversity of stakeholder perspectives.

Interviews and focus groups were conducted in Swedish and were digitally recorded. The study adhered to the guidelines set forth by the Swedish Ethical Review Authority. Prior to each interview or focus group, oral consent was obtained from all participants, ensuring they understood the study’s purpose, the nature of their involvement, and the use of their data. Participants were informed that their responses would be anonymized and that participation was voluntary, allowing them to withdraw at any time without needing to provide a reason.

3.2. Analysis

Both authors reviewed all recordings, independently identifying overarching themes to assess and reduce potential bias (Scholz et al.,

Table 1
Representation of interviewees and focus group participants across governance levels.

Sector	Public sector	Private sector	Civil sector	Total
National	1	1	2	4
Regional	8	5	6	19
Local	6	15	19	40
Total	15	21	27	63

2015). Themes were compiled and compared for consistency, then arranged along a spectrum from intrinsic (local relevance) to extrinsic (regional/national/international relevance). Observed differences concerning the subject and content of themes were discussed at this stage and resolved prior to further coding of the data.

An open-coding technique was then employed to extract factors and perceived causal relationships linking them from the focus group and interview data (Deegan, 2009; Kim and Andersen, 2012). By focusing our analysis on causal statements, we identified what stakeholders perceive to influence their goals, needs, and agency. The subsequent integration and analysis of these statements then allowed us to explore the complexity of stakeholder perspectives concerning a transition towards multifunctional landscapes as an interdependent system. Factors were categorized according to identified themes. We then applied iterative aggregation procedures to simplify and integrate causal data into a single interconnected network. These procedures included qualitative analyses of identified factors to assess conceptual similarity, and quantitative analyses concerning the number and direction of causal relationships linked to each factor to assess the functional contribution of each factor to the network (e.g., Bureš, 2017; Kim and Andersen, 2012). At this stage, conceptually and thematically similar codes were integrated under overarching concepts. Infrequently mentioned codes were individually analysed; codes with very few responses and low significance to the research questions and theoretical framework were excluded. Functionally similar relationships, particularly within themes, were individually assessed to see whether these could be aggregated. This multi-method approach ensured methodological triangulation and reduced risk of bias (Flick, 2020).

We analysed the structural properties of the resulting causal network using open-source Gephi software, employing graph theoretical statistics to measure key metrics (Table 2), including degree, betweenness centrality, closeness centrality, and eigenvector centrality (e.g., Gonzales and Parrott, 2012; McGlashan et al., 2016). These metrics measure

Table 2

We derived an importance score based on four network analysis statistical measures. This importance score was used to identify key factors. The selected measures are calculated for each node individually.

Statistical measure	Definition	Utility for identifying key factors
Degree	The number of edges (i.e., direct causal relationships) leading to and from a given node (i.e., identified factors).	Indicates the extent to which a given factor has been directly connected by unique causal relationships to other factors of the network. The greater the number of unique causal arguments attributed to a factor, the more important it is considered as a driver and/or mediator of causal influence throughout the network.
Closeness centrality	The average closeness of a node to all other nodes in an interconnected network, with closeness being the inverse of the distance to another node.	A high closeness indicates factors that need fewer causal links to connect to all other factors of the network. A closeness of zero means the factor is on the edge of the network without dependent causal relationships, i.e. an end-of-causal-chain factor.
Betweenness centrality	The frequency with which a given node appears on the shortest paths between all other pairs of nodes in the network.	Indicates important bridging factors with the ability to connect different clusters of causal arguments in the network.
Eigenvector centrality	A measure of the influence of a node in a network that accounts for the importance of its neighbouring nodes.	High eigenvector centrality indicates factors that may influence the system due to their close connections to other important factors.

the number of unique causal relationships identified per factor and their central structural properties in relation to the network as a whole, with the underlying assumption that more important factors are referenced more frequently by stakeholders and explored more thoroughly in the data.

To quantify the structural importance of all factors within the network, we developed a structural “importance” index (Eden, 2004; Oliva, 2004). Each factor was assigned a combined importance score ranging from 0 (low importance) to 4 (high importance). This score was calculated from the frequency with which each factor scored above the third quartile for each statistical measure. Key factors were identified as those that received the maximum score. Additionally, we identified edge nodes – factors at the very edge of the network (i.e., in-degree = 0, and therefore by definition betweenness = 0 and eigenvector centrality = 0) – as key factors if they scored above the third quartile for closeness centrality and out-degree (i.e., number of unique causal relationships from the identified node).

Coded factors in the final network were also categorized according to SESF first-tier variables, allowing us to identify themes that spanned multiple variables and to categorize and understand key factors identified by the causal network analysis. As stakeholder discussions within identified themes often covered a range of topics, key factors could be categorized under more than one variable, reflecting the complex interdependencies among stakeholder perspectives.

Finally, we held two workshops with participants from Laxå municipality (2), tourism entrepreneurs (1), forestry entrepreneurs (1), and the dominant forest owner, Sveaskog Co. (3) to review and validate findings related to themes, key factors, and their influence on the emergence of a MFL initiative in Tiveden. Data from the workshops were integrated with existing data.

4. Results

4.1. Overview

We identified 11 themes from the focus group and interview data

Table 3
Themes among stakeholder perspectives were arranged along a spectrum from intrinsic (i.e. dealt with factors that were primarily relevant within the local forest landscape/ municipality) to extrinsic (i.e. primarily relevant at regional/ national/ international levels).

	Themes
INTRINSIC	Natural values
	Municipal sector engagement
	Socio-cultural values
	Collaboration and dialogue
	Economic values
	Forest management
	Geographical factors
	Knowledge and competence
	Opinion building
	Tourism
EXTRINSIC	Institutional & regulatory systems

regarding factors influencing the well-being of local actors, firms, and communities in and around the Tiveden forest massif (Table 3). Most themes encompassed both intrinsic and extrinsic factors, focusing on social system phenomena related to the two primary economic sectors: industrial forestry and tourism, as well as ongoing collaborative efforts to establish a multifunctional landscape around Tiveden National Park.

Our open-coding protocol identified a total of 1065 causal relationships comprising 1232 individual factors. Through iterative aggregation, we developed a final interconnected network (Fig. 3) consisting of 441 unique nodes (factors) linked by 750 unique edges (causal relationships).

The causal network analysis initially identified 32 key factors (KFs) based on the importance index criteria (Table 4 and Supplementary materials). Notably, one key factor, *Spread of visible clear-cuts around Tiveden* (KF18), was identified using extended criteria to include edge variables. An additional key factor, *Climate change* (KF33), emerged during group workshops. Nearly half of the key factors were associated with the themes of Forest Management and Tourism. No key factors were identified within the themes of Municipal Sector Engagement, Economic Values, Geographical Factors, or Institutional and Regulatory Systems.

4.2. Natural values

Stakeholders discussed various natural values of the landscape. Discussions of *biological diversity around Tiveden* (KF1) focused on species distribution, richness, and the interconnected natural processes that support forest succession towards multi-age and multi-species forest structures. They identified large, naturally rich forest areas and broader scale dynamics surrounding Tiveden as vital for local biodiversity. Biodiversity – particularly charismatic species such as capercaillie, moose, beaver, and wolf – was associated with attracting tourists and therefore aligned with the objectives of the Nature Tourism Business Association. However, a tension was observed between production-oriented and conservation-/tourism-oriented perspectives concerning biodiversity, with the reliance of forestry stakeholders on intensive forest management practices perceived by many other stakeholders as leading to landscape simplification and loss of forest biodiversity.

Discussions concerning both *quality of nature experience surrounding Tiveden* (KF2) and *Tiveden's high natural and cultural values* (KF3) emphasized the forest landscape's productivity as a resource for both forestry and nature-based tourism, often intertwining perceived demand for natural values with user preferences e.g., for light, open, mixed broadleaf forests with older trees. Elements such as “quiet, untouched forest”, “pristine lakes” and perceptions of “wilderness” were deemed essential for supporting non-consumptive uses such as nature-based tourism. Sub-themes included perceived threats to natural values from forest management practices and high visitor numbers, as well as conservation practices to maintain these values. Stakeholders also recognized KFs 1–3 as important indicators of outcomes, particularly concerning the clearcut-free management system that the collaboration aimed to introduce.

4.3. Municipal sector engagement

Tiveden's forests were identified as a core component of Laxå municipality's identity. Many stakeholders highlighted the municipality's central role in an initiative to create a “visitor-friendly” forest zone around the national park, based on a strategic municipal vision to develop a nature-based tourism industry leveraging Tiveden's high natural and cultural values. Marketing itself as the “Tiveden eco-tourism area,” the municipality invested in initiatives such as bus lines and dedicated liaison personnel to support this development. Municipal officers were granted a broader mandate to represent the mostly overlapping interests of local residents and tourism operators in collaborative dialogues with Sveaskog and other key stakeholders

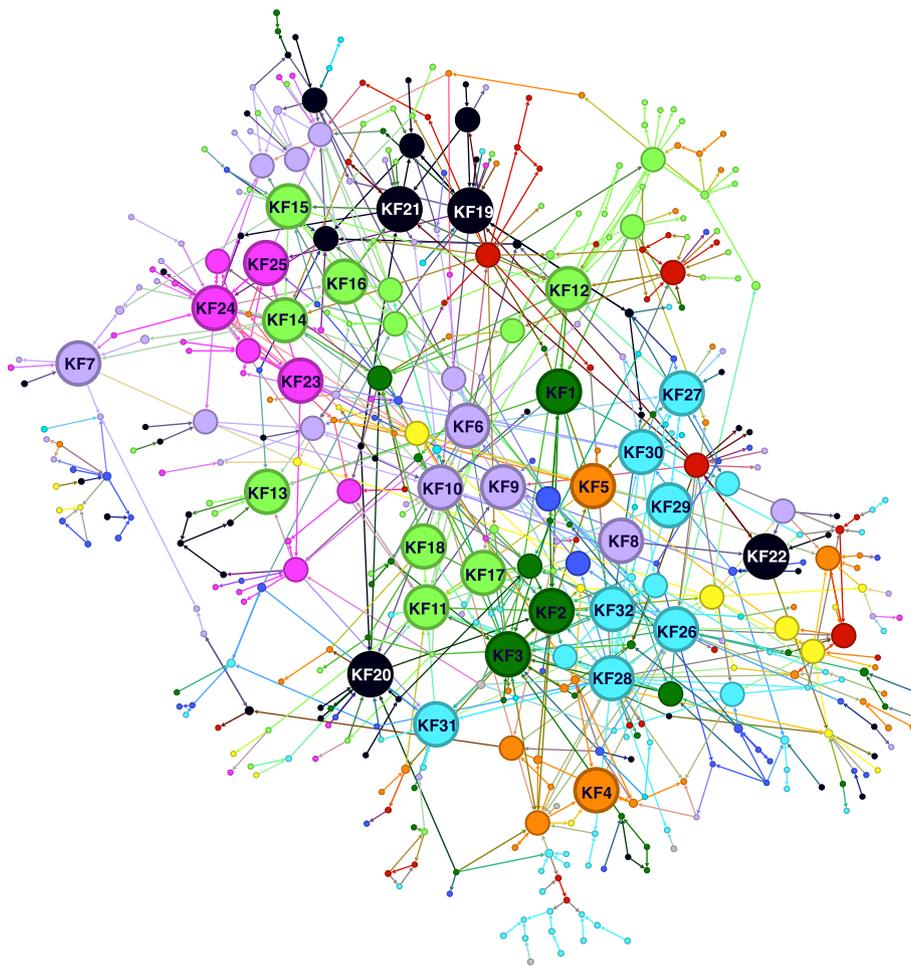


Fig. 3. Causal network comprising 441 unique factors identified in stakeholder focus groups and interviews concerning factors important for personal well-being, for firms and local communities in and around Tiveden's forest landscape. Node size indicates importance (see Methods). Network analysis revealed 32 key factors (KFs), which are represented by the largest nodes. Colours indicate themes: Natural values (dark green), Municipal sector engagement (yellow), Socio-cultural values (orange), Collaboration and dialogue (mauve), Economic values (red), Forest management (light green), Geographical factors (turquoise), Knowledge and competence (black), Opinion-building (pink), Tourism (light blue), Institutional and regulatory system (dark blue), and Other (grey). Nodes are connected by causal relationships, coloured by the theme of the independent variable. The network layout uses a force atlas algorithm, positioning strongly interconnected nodes centrally and less connected ones towards the periphery. Climate change (KF33) was not initially identified as a key factor but was added later based on stakeholder feedback during review workshops. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

regarding a transition away from clear-felling management in Tiveden.

4.4. Socio-cultural values

Local residents in Tiveden and Laxå municipality attached high importance to socio-cultural values associated with the forest landscape. Two key factors were identified within the socio-cultural values theme (Table 4 and Supplementary materials). *Active local community engagement* (KF4) such as developing new trails and hosting events bringing different interest groups together was perceived to support landscape multifunctionality. This engagement was driven by depopulation dynamics and the loss of local services such as schools during recent decades, fostering a collective sense of abandonment. Alongside enhancing the *quality of life and identity of local residents* (KF5), Tiveden's natural and cultural values motivated local tourism entrepreneurs and were perceived as key to attracting and retaining residents, providing peace and quiet, nature experiences, and a core sense of personal identity. Participants also recognized the historical importance of forestry for the municipality and discussed recent initiatives towards clear-cut free management as important for job creation in the burgeoning tourist industry. However, there were divergent views concerning the desirability of the latter with some local residents expressing ambivalence

about a tourism-led development and voicing concerns that increasing tourist visitor numbers and tourism infrastructure risked Tiveden being taken away from them.

4.5. Collaboration and dialogue

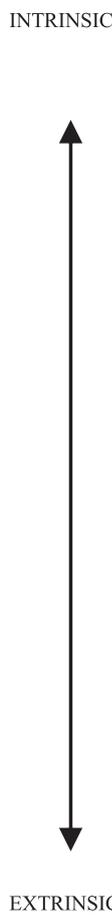
Stakeholders highlighted various collaborative relationships connecting local, regional, and national actors involved in the initiative for collaborative planning and management of the forest surrounding the national park. This initiative served as a platform for dialogue among diverse interests – including landowners, tourism operators, foresters, and municipalities – each with differing, often conflicting, goals for Tiveden. For example, municipal and tourism actors prioritised a 'visitor-friendly' forest while forestry actors emphasized operational flexibility and experimentation with new production techniques.

Five key factors were identified within this theme (Table 4 and Supplementary materials). Two of these focused on efforts to establish new collective choice rules for local forest management, through the potential establishment of a *clearcut-free zone surrounding the national park* (KF6) and a *formal contract or declaration of intent concerning collaborative establishment and long-term management* of the area (KF7). The clearcut-free zone represented a point of eventual, partial

Table 4

Matrix linking themes (bold, rows) among stakeholder perspectives to first-tier variables of the Social-Ecological Systems Framework (SESF) (columns). Shaded areas indicate overlaps between the primary content of stakeholder discussions within themes and SESF variables. “KF...” denotes key factors identified by causal network analysis within themes, which were then categorized according to SESF variables. A more detailed table categorising individual key factors according to second-tier SESF variables was used in the generation of this table and is available in the Supplementary materials.

Themes	Biophysical system		Social system		Exogenous drivers		
	Resource system (RS)	Resource units (RU)	Governance systems (GS)	Actors (A)	Interactions (I)	Outcomes (O)	Social, Economic and Political Settings (S) Related Ecosystems (ECO)
Natural values	KF1, KF2, KF3	KF1				KF1, KF2, KF3	KF1
Municipal sector engagement							
Socio-cultural values				KF4, KF5			
Collaboration and dialogue			KF6, KF7		KF8, KF9, KF10		
Economic values							
Forest management	KF11	KF12	KF12, KF13, KF14, KF15, KF16, KF17	KF12, KF16	KF12, KF18	KF11, KF17	
Geographical factors							
Knowledge and competence				KF19, KF20, KF21, KF22	KF22		
Opinion building			KF23		KF23, KF24, KF25		
Tourism	KF26, KF27, KF28			KF27, KF29	KF26, KF30		KF31, KF32
Institutional & regulatory systems							
Other							KF33



agreement among different groups, as it offered Sveaskog an opportunity to experiment with different management methods aligned with company objectives. However, municipal and tourism sector stakeholders expressed concerns about whether Sveaskog's interpretation of clearcut-free management would achieve the multifunctionality envisioned as a “visitor-friendly” forest. Underlying distrust caused some stakeholders to worry that future representatives of Sveaskog might not honour verbal agreements made within Collaboration Tiveden. Municipal stakeholders strongly favoured a binding formal agreement to secure long-term commitments and branding opportunities for the

“Tiveden eco-tourism area.” Sveaskog's refusal to formalize any agreement underscored divergent risk perceptions and priorities, and fostered further uncertainty about its long-term dedication to preserving the landscape's natural and cultural values.

The remaining key factors pertained to interactions. *Cooperation and contacts between municipality, county board and tourism sector* (KF8) and *communication and collaboration between different stakeholders* (KF9) involved information sharing, networking, and self-organizing activities. These efforts were vital for developing a common knowledge base, planning investments, and deliberating on challenging decisions. A

common sub-theme was the lack of a shared language, particularly regarding clear definitions of key terms. For instance, many stakeholders referred to the proposed area around the national park as a “buffer zone,” which raised concerns among higher-level stakeholders about setting a precedent that could restrict the timber industry’s operations near other protected areas. Municipal and nature-based tourism stakeholders therefore tried to create a coherent, shared *vision of “visitor-friendly” forest and eco-tourism to create growth for the municipality and quality of life for local residents* (KF10). This vision became a crucial element supporting communication and opinion-building activities at multiple levels.

4.6. Economic values

Municipal and local tourism stakeholders highlighted the importance of economic arguments to convince other key stakeholders of the profitability of nature-based tourism and thereby to support the development of a “visitor-friendly”, clearcut-free zone. This zone was envisioned by municipal and tourism actors as a way to maintain incomes from wood production for Sveaskog while expanding tourism revenues, but forestry stakeholders highlighted difficulties comparing the economic viability of alternative management methods to understand potential costs and benefits, signalling scepticism about claims that clearcut-free management could match conventional timber-based returns. Other sub-themes concerned availability of municipal and/or donor funding to invest in the initiative and related projects, the impact of tourism revenues and new residents on local tax receipts, and the importance of forestry incomes for state coffers as a main driver of Sveaskog’s management decisions.

4.7. Forest management

Stakeholder perceptions of the influence of forest management in Tiveden encompassed a broad range of SESF variables and included a total of eight key factors (Table 4 and Supplementary materials). Three of these pertained to the use of *intensive clear-felling* (KF12), the *spread of visible clear-cuts around Tiveden* (KF18), and the *widespread perception that visible clear-cuts in the area surrounding Tiveden national park were increasing and having a negative impact on tourism, livelihoods, and the living environments of local population* (KF11). While forestry actors tended to frame clear-felling as a normal and necessary practice under existing rules and economic expectations, these factors contributed to growing dissatisfaction among local residents, who perceived that intensive logging threatened multiple values in the forest landscape, and, by extension, local tourism and the local community. Stakeholders discussed the impacts of specific technologies and methods used in intensive clear-felling, as well as how operational and constitutional rules supported these practices. For instance, a reduction in the average harvesting age of trees across Sveaskog’s holdings led to more forest areas around Tiveden being classified as nearing the allowed harvesting age.

Concerning the development of operational rules, many stakeholders identified a more *adaptive, flexible, multi-use forest management* (KF13) as an ideal alternative to current intensive practices, although there were no clear definitions for this concept in the context of Tiveden. Given the predominantly negative perception of clear-felling methods, *Sveaskog’s support for an initiative for a clear-cut free zone around the national park* (KF14) was seen as a crucial step towards creating a more “visitor-friendly” forest landscape. However, opinions within Sveaskog varied, reflecting internal disagreements within the company. Local Sveaskog representatives were generally more supportive of the initiative, while regional and national representatives were more concerned that such spatial restrictions could constrain future harvesting options and might set a precedent for similar initiatives elsewhere. Sveaskog also faced external national pressures to both support and reject such initiatives.

Sveaskog’s interest in developing clearcut-free methods (KF15) was

viewed as a legitimate argument for its engagement with Collaboration Tiveden, particularly in light of anticipated pressures to move away from intensive clear-felling practices, and was seen as a vital driver for adopting new forest management approaches in the area. The company proposed using the area around the national park for experimentation and evaluation of clearcut-free methods, which could enhance its knowledge base while creating a more visitor-friendly landscape. However, learning through formal evaluation did not materialize.

At the local level, stakeholder discussions highlighted instances where *Sveaskog was willing to accommodate natural and cultural values in their management of forests surrounding Tiveden* (KF16), such as maintaining visitation infrastructure and considering natural and cultural values when planning clear-cuts near popular walking trails. Nevertheless, forestry stakeholders questioned the extent to which the company could further accommodate these values, given *Sveaskog’s current objectives and commitments to conserve and protect natural and cultural forest values* (KF17) in other areas, alongside directives to maximize economic returns for the state. In this regard, Sveaskog’s engagement in Collaboration Tiveden was linked to its corporate reputation and role as the largest landowner in the municipality, obligations stemming from FSC certification, internal commitments to stakeholder consultation processes that consider natural and cultural forest values and the potential of its corporate leadership. Stakeholders also discussed various exogenous drivers of intensive forest management, including economic, institutional, and historical factors, and an increasing reliance on foreign seasonal workers.

4.8. Geographical factors

Discussions of geographical factors mostly concerned Tiveden’s location in a sparsely inhabited border zone between two historical centra for food production and government in Sweden. The area was perceived variously by participants as both inaccessible – a wilderness area far from roads that was attractive to tourists – and accessible due to its relative proximity to larger cities and good transport infrastructure. Other discussions concerned where Tiveden’s formal and informal borders lay, and the extent of the proposed clear-cut free management zone.

4.9. Knowledge and competence

Stakeholder participants discussed various factors related to research, knowledge exchange, stakeholder analyses, and digital planning tools. Key factors included concerns about the inadequacy of current *knowledge concerning “visitor-friendly” forests, sustainable tourism*, (KF19), with stakeholders noting an inability to define sustainable nature-based tourism locally, what constitutes a “visitor-friendly” forest or the management methods needed to achieve it (Table 4 and Supplementary materials). Insufficient *quality of knowledge and data about the tourism sector in the municipality* (KF20), such as the number of available hotel beds, local visitor numbers and preferred activities of nature-focused tourists, was said to hinder implementation of a clearcut-free zone around the national park. Tourism entrepreneurs and municipal officers particularly stressed inadequate *knowledge and engagement among decision-makers and the general public concerning forest ecology, natural and cultural values* (KF21) as a barrier to the proposed clearcut-free zone. Forestry stakeholders on the other hand pointed to the *inadequacy of knowledge and tools for clear-cut free forest management* (KF22) – including definitions, practical implementation, impact measurement, and economic consequences – as a key barrier, underscoring different views on what kinds of knowledge were most urgently needed. The leadership, experience, and networks of core members of Collaboration Tiveden were also recognized as valuable assets in developing a MFL in Tiveden.

4.10. Opinion-building

Local municipal and tourism-industry stakeholders launched a campaign to garner broad cross-sectoral support for the vision of a “visitor-friendly” forest surrounding the national park (KF23) among key stakeholders at local, regional, and national levels (Table 4 and Supplementary materials). New narratives and pedagogical tools were developed to demonstrate how a sustainable forest management approach around Tiveden could benefit local tourism and residents. The success of this campaign was attributed to the *intensity of lobbying activities* (KF24) by municipal and nature-based tourism operators. Stakeholders also noted that increased public environmental awareness made decision-makers and residents more sensitive to the quality of nature experiences in Tiveden and potential losses due to clear-cutting. A concerted awareness-raising campaign drew media attention to the natural and cultural values of the forest landscape, stimulating public debate about the threats posed by Sveaskog's intensive management approach. These efforts ultimately secured support from influential stakeholders, including local and national politicians, government organizations, non-governmental organizations, and residents for a clearcut-free zone surrounding the national park, placing *pressure on Sveaskog to support the initiative* (KF25).

4.11. Tourism sector

Stakeholder discussions regarding the tourism industry in Tiveden primarily centred on enhancing economic returns from tourist enterprises while preserving its reputation as a premier destination for nature-based tourism. Seven key factors emerged from these discussions, encompassing aspects of the biophysical system, social system, focal action situation, and exogenous drivers (Table 4 and Supplementary materials).

The number of *visitors to Tiveden* (KF26) was discussed in terms of economic outcomes and the landscape's capacity to accommodate tourists without compromising its natural and cultural values. Local and municipal stakeholders indicated that visitor levels were nearing their limits, with negative impacts already evident in certain forest areas. A central argument for establishing a clear-cut free zone was that it would alleviate visitor pressure on the national park while allowing nature-based tourism enterprises to expand in adjacent areas.

Discussions also addressed the increasing *range of available tourism options and activities in and around Tiveden* (KF27), exploring how to identify additional niches for locally based enterprises without further harming forest values. Stakeholders considered the landscape's ability to support a growing tourism sector amid the effects of current and planned intensive clear-felling.

Investments in, and maintenance of, visitor-related infrastructure (KF28) – including walking and bridle trails, small jetties, toilet facilities, information boards, and maps – were deemed essential for supporting diverse nature-based tourism activities and creating job opportunities for local entrepreneurs. The natural and cultural values of the forest landscape were recognized as vital for fostering new *tourism entrepreneurs driven by a visitor-friendly mentality and ambition to create opportunities within the forest* (KF29).

Stakeholders also discussed various information-sharing and networking initiatives organized by tourism operators and the municipality to promote *development and marketing of Tiveden as an eco-tourism destination* (KF30). Nearby municipalities and tourism operators were beginning to leverage Tiveden's brand recognition for their marketing efforts, with some initiatives, such as a common web-based booking system, receiving regional funding.

Growing *demand for sustainable, nature-based tourism* (KF31) was highlighted, driven by international trends favouring “untouched” Nordic forests amid increasing environmental awareness and urbanization. Maintaining *Tiveden's reputation as an attractive, internationally well-known destination for nature-based tourism* (KF32) was seen as crucial

for capitalizing on these trends.

4.12. Institutional and regulatory system

No key factors were identified concerning institutional and regulatory factors. Stakeholder discussions primarily concerned four sub-themes. 1) Forestry institutions and laws, especially pertaining to Sveaskog Co., whose directives concerning economic objectives, consideration of natural and cultural forest values, clear-cut free management, and carbon sequestration targets were perceived to be steered by the Swedish government. 2) Land ownership, particularly the perceived importance of landowner rights in relation to adjacent protected areas and tourism-infrastructure such as hiking trails and bridle tracks. 3) Protected areas, particularly Tiveden national park. County boards were perceived to focus on nature protection while managing natural parks and nature reserves under government and Environmental Protection Agency directives. Issues pertaining to nature-based tourism were perceived to lack representation, with some stakeholders highlighting a need for a strong organization to advocate for the industry. Discussions also concerned the need to manage heavy visitor loads, including potential park closures or redirecting visitors to surrounding areas with high natural and cultural values. 4) Regulations governing tourism enterprises were identified as impenetrable and difficult to influence by both tourism and municipal stakeholders. In contrast, Sveaskog was perceived to have greater capacity to navigate and shape institutional frameworks concerning forestry.

4.13. Other emerging themes

Climate change (KF33) was rarely mentioned during initial focus groups and interviews. It was therefore not identified by the network analysis as a key factor. However, during review workshops, stakeholders suggested that, following a nationwide drought during 2018 that triggered large forest fires and bark beetle disturbance in a neighbouring region, this factor had rapidly become one of the most important factors influencing the landscape. Concerns were expressed about how changing climate patterns might negatively impact nature-based tourism. Some stakeholders also suggested that comparatively cooler Nordic forests might become more attractive in the future. Forestry actors, on the other hand, were concerned about the impacts of climate change on timber production, insect damage, and carbon sequestration.

5. Discussion

5.1. Overview of results

Forestry debates are increasingly framed in ideological terms as being either for or against natural or economic values, particularly in countries with a well-established industrial forest sector. However, in line with research from analogous contexts such as Canada (e.g., Chiasson et al., 2019) and Finland (e.g., Kuuluvainen et al., 2019), our study shows stakeholder interests in Sweden to be more complex than this polarized view suggests. Our causal network analysis identified 11 core themes and 33 key factors from focus groups and interviews with a diverse group of stakeholders in a Swedish forest landscape concerning what is important to their wellbeing, for local businesses and for their community. We found that local stakeholders associated a range of natural and economic values with forest landscapes in Tiveden. This included high biological diversity within a remnant of an old-growth forest wilderness alongside multiple commodity and non-commodity outputs, primarily concerning timber production and nature-based tourism.

Importantly, our findings also highlight the importance of socio-cultural values of forest landscapes – a dimension that is often marginalised in debates dominated by industrial actors and stakeholders (Fischer, 2018; Lidestav et al., 2020; Sténs et al., 2016). For example,

alongside recreational value, our results highlight the importance of forest landscapes for residents' quality of life and sense of personal identity as well as for supporting community engagement. Forest management legacies and historical grievances concerning previous municipal interventions were found to shape socio-cultural values attached to the forest. These findings support previous studies concerning the crucial role of cultural forest ecosystem services for community well-being (e.g., [Elsasser et al., 2021](#)) and resonate with an ongoing policy shift towards sustainable forest management and multifunctional forests in many countries, which increasingly recognizes greater diversity of ecosystem services as vital for sustainable development ([Nebasifu et al., 2025](#); [Pülzl et al., 2024](#)).

Our participant stakeholders primarily discussed issues that were related to the *social system* and to *focal action situations* (Table 4). Social system factors mostly concerned the main identified *actors* – municipal officers, local residents, foresters, and nature-based tourism entrepreneurs. Focal action situations were primarily concerned with *interactions* between these actors and/or with the landscape. In contrast, and echoing [Dawson et al. \(2025\)](#), discussions concerning the biophysical forest system were comparatively few and largely focused on instrumental values of the Tiveden landscape to support economic and social outcomes. Although respondents referred to factors such as biodiversity and ecological forest processes, biophysical factors were typically discussed in terms of demand for specific types of forest ecosystem services, e.g., to satisfy the aesthetic preferences of tourists. Key biophysical factors – concerning high natural and cultural forest values and the quality of nature experience – were perceived by stakeholders in relation to the productivity of nature-based tourism ventures in the area and as measures of overall social and ecological performance of the landscape. Potential explanations for the apparent dominance of anthropocentric perspectives are that participants may have lacked interest or knowledge about the biophysical system per se, and therefore referred to it less frequently, or that they primarily associated responsibility for forest ecological functions with higher level stakeholders (see also *Limitations*). For example, respondents associated nature protection and the management of the national park with regional and national stakeholders. Our analysis identified lack of knowledge of forest ecology and values among decision-makers and the general public as a key factor and the apparent lack of consideration of exogenous biophysical dynamics, including about climate-related challenges, also points to a lack of understanding of the complex interplay between exogenous and endogenous forest dynamics ([Felton et al., 2023](#); [Sousa-Silva et al., 2018](#)). It may also indicate the bounded rationality of actors in complex systems (e.g., [Simon, 1972](#)).

Reflecting broader trends in the European forest discourse (e.g., [Winkel et al., 2022](#)), the two main economic sectors in the study area, *forest management* and *tourism*, were the most frequently discussed themes and together accounted for nearly half of all identified key factors. However, as [Fig. 3](#) and [Table 4](#) indicate, our findings show considerable interdependence within and between these two themes, and in relation to the biophysical system, governance systems, actors, interactions, outcomes and social, political and economic settings. In Tiveden, competition between economic interests concerning forestry and tourism was perceived by many local stakeholders as the crux of the major underlying conflict in the landscape and thereby associated with a wide range of governance and management issues beyond economic value creation. This illustrates how the continued primacy of economic discourses in forest landscapes ([Fischer et al., 2020](#); [Pülzl et al., 2024](#)) contributes to the *perception* of incompatible interests among different groups as a core challenge for MFLs ([Godtman Kling et al., 2019](#); [Sayer et al., 2015](#)). This is echoed in many contexts, where the interplay between different economic sectors often leads to conflicts that negatively influence the wellbeing of local forest stakeholders and communities and require multifaceted governance approaches ([Lazdinis et al., 2019](#); [Widmark, 2009](#)).

Our findings in this regard highlight the additional governance

challenges associated with MFLs and show how attempts towards adaptive cross-sectoral collaborations may emerge in response to these challenges (e.g., [García-Martín et al., 2016](#); [Kristensen et al., 2022](#); [Nebasifu et al., 2025](#)). In Tiveden, local stakeholders responded to conflicting interests by developing a cross-sectoral collaborative initiative aimed at exploring the compatibility of forestry and nature-based tourism through the development of a multi-use, clearcut-free zone surrounding the national park. Several key factors were related to collaboration and dialogue, opinion-building and knowledge and competence. Stakeholders expressed that these factors were developed to engage conflicting perspectives on important forest functions and for navigating perceived conflicts and imbalanced power relations towards a consensually acceptable management regime. However, given the influence of strong ownership rights ([Elbakidze et al., 2018](#); [Hertog et al., 2022b](#)), our results also illustrate the difficulties faced by initiatives aimed at collaborative co-management of MFLs and indicate that the success of such initiatives in European contexts remains dependent on the current and future goodwill of forest owners. For example, although Sveaskog Co. finally agreed to a clearcut-free zone, they were primarily interested in using the area to show-case different forms of forest management rather than in actively contributing towards a “visitor-friendly forest” by engaging in evaluation of ecological and socio-cultural consequences on the ground ([Angelstam et al., 2019b](#); [Axelsson et al., 2013](#)), and would not formalize any agreement concerning future management in the area.

5.2. Implications for bottom-up development of multifunctional forest landscapes

Taken together, our findings highlight the complex interdependencies among ecological, economic, and socio-cultural functions of forest landscapes and stress the importance of understanding these relationships in the context of stakeholder perspectives and management practices. This underlines a fundamental challenge associated with developing transformative forest governance ([Kleinschmit et al., 2024b](#)) and underscores the importance of fostering inclusive frameworks that promote bottom-up collaboration to support dialogue, deliberation, conflict resolution, shared ownership and the sustainable management of MFLs ([Godtman Kling et al., 2019](#); [Nijnik et al., 2010](#); [Sayer et al., 2015](#); [Winkel et al., 2022](#)). However, our findings show that collaborative dialogue remains challenging, particularly in contested, polarized forest landscapes, where entrenched interests, historical grievances and power imbalances complicate collaborative efforts to explore the potential for diversification of forest functions. This mirrors broader experiences in Europe and globally (e.g., [Chiasson et al., 2019](#); [Elbakidze et al., 2022](#); [Lonkila et al., 2025](#); [Nebasifu et al., 2025](#); [Wang et al., 2024](#)), suggesting that the Tiveden case is emblematic of more widespread governance difficulties in establishing MFLs. Below, we highlight constraints and opportunities for the bottom-up development of MFLs in contexts dominated by intensive forest management, based on our findings and with particular regard to success factors identified in [Ostrom \(2009\)](#). With regard to our framework, constraints were primarily related to the social system and focal action situation whilst opportunities were primarily related to biophysical system components.

5.2.1. Constraints

As in many regions grappling with the impacts of intensive resource use on local ecosystems and communities (e.g., [Kröger and Raitio, 2017](#)), our findings suggest that the use of intensive forest management based on clear-felling with shortened rotations remains a major constraint to MFLs in contexts where such management is predominant, even when interspersed with small islands of high conservation value forests ([Angelstam et al., 2020](#)). We identified several key factors highlighting the importance of high natural and cultural forest values for attracting both tourists and rural residents, and the perceived negative impacts of intensive forest management on these values. This underlines

the need for alternative, less intensive forest management approaches to support MFLs, particularly in areas where other sectors depend on cultural ecosystem services like recreation and aesthetic appeal (Angelstam et al., 2020). Closer-to-nature methods, for example, are argued to supply a broader range of forest ecosystem services (Larsen et al., 2022), maintaining biodiversity and ecological resilience while supporting nature-based tourism and local quality of life. Indeed many countries in Europe have considerable experience of alternative management methods (Mason et al., 2022), demonstrating that sustainable practices can coexist with economic interests. However, while a shift away from clear-cutting is supported at the European level (European Commission, 2021), a widespread transition to alternative methods in Sweden and elsewhere is often associated with multiple socio-cultural, institutional and economic challenges (e.g., Dawson et al., 2025; Elbakidze et al., 2018; Hertog et al., 2022b; Puettmann et al., 2015).

Furthermore, our study illustrates the autonomy that large forest owners in countries with industrial forest sectors enjoy to craft and enforce their own rules, and to disregard claims from other users whose needs are based on different portfolios of forest ecosystem services (e.g., Ostrom, 2009; Sargent et al., 2018). As a multi-level, state-owned actor and major landowner, Sveaskog Co. was perceived by local stakeholders as having the most influential role in the Tiveden landscape. We identified six key factors in the governance system related to rules for forest management (Table 4 and Supplementary materials), while none were identified within tourism or municipal sector themes. Two key factors (KFs 6 & 7) concerned attempts by local stakeholders to access or redistribute decision-making power within a collaborative initiative. Large landowners often dominate decision-making processes, making it difficult for local stakeholders to have their voices heard (Angelstam et al., 2022; Sayer et al., 2015). Our results highlight a need to better address power imbalances among forest stakeholders to empower bottom-up initiatives towards MFLs (e.g., Godtman Kling et al., 2019). This appears particularly relevant where incumbent users operate at multiple levels with entrenched institutional support, while prospective users primarily operate at the local level with little or no access to such support.

Collaborative resource governance initiatives are more likely to succeed when users share common knowledge of relevant SES attributes and understand how their actions affect one another (Ostrom, 2009). However, in line with many previous studies (e.g., Dawson et al., 2025; Elsasser et al., 2021; Fredman et al., 2023; Hertog et al., 2022b; Shepard et al., 2020), our analysis indicates a lack of knowledge among forest decision-makers and stakeholders concerning forest ecosystem services beyond wood production. This leaves other forest-based activities like recreation and tourism unaccounted for. Our case study highlighted a lack of knowledge and tools regarding clearcut-free alternatives, including basic definitions, implementation strategies, and evidence of their impacts on various forest landscape values and outcomes. We also observed inadequate knowledge concerning “visitor-friendly forests” and sustainable tourism. Despite policy commitments to address these gaps (Naturvårdsverket, 2019), such deficiencies hindered communication within Collaboration Tiveden, complicating the development of a shared vision and broader support for transitioning to MFLs.

Moreover, studies of successful collaborative forest management initiatives highlight the importance of a diversity of perspectives (Doucet et al., 2024; García-Martín et al., 2016). Our findings reveal clear differences in perceptions of forest management actors in Sweden compared to other landscape actors. Municipal officers, residents, and tourism entrepreneurs appeared to be the main agents of change in the social system and were linked with a broad set of key factors important to bottom-up collaborations (e.g., Ostrom, 2009), including social capital, historical experiences, dependence on forest resources, knowledge of the landscape, leadership, and interactions such as information sharing, networking and lobbying. In contrast, forest management actors were perceived primarily as agents of change in the biophysical

system focusing on available technologies and timber harvesting. This reflects a narrower perspective applied by industrial-scale timber producers compared to the broader spectrum of economic, social, and ecological perspectives that other actors often apply to forest landscapes (e.g., Deuffic et al., 2018; Eriksson and Fries, 2021; Lidestav et al., 2023).

Our findings underline competing interests and distrust between new/prospective users of forest values (e.g., nature-based tourism operators) and local residents on the one hand, and established industrial forest management stakeholders focusing on conventional timber extraction on the other, as common barriers to effective forest collaborations and dialogue (e.g., Elbakidze et al., 2022; Lorenzini and Von Jacobi, 2024). Further, our results reveal a circular logic regarding trust in these collaborative initiatives – as both a necessary input and a desired output – and problematize the role of collaborative dialogue as a panacea for management of polarized landscapes. Local stakeholders sought to quell distrust through formalized agreements, but failure to reach such agreements sowed further uncertainty and distrust, increasing transaction costs in terms of time and goodwill (e.g., Ostrom, 2009). This underscores the importance of early efforts to strengthen trust in contested landscapes. In this regard, previous studies (e.g., Bettis et al., 2021; Dawson et al., 2017; Hölting et al., 2020) emphasize the need for frequent small wins within collaborative initiatives. However, powerful and unwilling incumbent actors may present insurmountable obstacles (Chiasson et al., 2019).

In light of the above, a fundamental question for the development of MFLs remains: how can new functions be introduced in a landscape where there are already well-established functions, particularly when incumbent users are also landowners who enjoy strongly protected use rights? Several authors argue, for example, that public good aspects should be more strongly considered in relation to ownership and legal status concerning multifunctional landscapes (e.g., Kaljonen et al., 2007; Vejre et al., 2012). Others have pointed to new forms of collaboration that are increasingly explored in European and other contexts including social innovations and enterprises (e.g., Barlagne et al., 2021; Lawrence et al., 2021), and participatory management on public land or local partnerships, such as the Model Forest approach and movement (Angelstam et al., 2019a). However, while collaborative initiatives are often seen as a means to redress power asymmetries in forest landscape planning (e.g., Winkel et al., 2022), large landowners and multi-level stakeholders often prefer to engage with higher-level institutions, partly due to the misfit between their concerns and the scale of collaborative initiatives (Elbakidze et al., 2015). Moreover, Bjärstig et al. (2024) highlight the limitations of collaborative processes in contested policy arenas, arguing that overarching priorities must be set by elected decision-makers to ensure democratic accountability, legitimacy and acceptance.

5.2.2. Opportunities

In addition to multiple constraints, our case study in Tiveden identified several factors that highlight European forest landscapes as, at least superficially, conducive to bottom-up management collaborations. Key resource units for both forest management and nature-based tourism, such as trees and lakes, are predominantly immobile, and system dynamics in boreal forests appear sufficiently slow-moving and predictable for local stakeholders to understand the consequences of continued intensive harvesting. The proposed 2000 ha “visitor-friendly” zone surrounding Tiveden national park was perceived by most stakeholders as sufficiently large to generate substantial value flows for local businesses and residents’ wellbeing. Ostrom (2009) notes that bottom-up collaborations are more likely to succeed when users depend on the sustainability of the resource system for their livelihoods. This may partly explain the eagerness of locally-anchored tourism businesses and residents to engage in collaborative activities, as observed in our case, and the relative reluctance of Sveaskog – a state-owned company with extensive forest holdings throughout Sweden – to do the same. However,

despite these apparently conducive elements, several caveats remain: the impacts of clear-cut free methods on biodiversity are poorly understood and remain loosely defined (e.g., Felton et al., 2024; Puettmann et al., 2015); nature-based tourism enterprises often depend on mobile charismatic fauna (e.g., Dybsand and Fredman, 2021; Winterbach et al., 2015); and much larger areas and high-quality habitat are typically required to sustain viable populations of many focal species (e.g., Angelstam and Manton, 2021).

Ironically, the extensive use of clear-cutting may trigger the inception of bottom-up collaborations among local forest stakeholders towards MFLs. Elbakidze et al. (2017) showed that clearcuts and intensively managed forests are low-preference land cover types for both urban and rural people in Sweden. Our results showed that the visible impacts of intensive forest management are strongly perceived by local stakeholders to negatively impact their wellbeing and nature-based tourism opportunities. This may galvanize community action and collaboration. Godtman Kling et al., 2019, for example, argue that visible conflicts increase stakeholder engagement and stimulate creative solutions.

5.3. Limitations

To grapple with the systemic complexity surrounding MFLs, we developed and implemented a novel, complex systems-based research methodology. We highlight several limitations relevant to the interpretation of our results. First, we found that participating stakeholders identified relatively fewer biophysical factors compared to social system factors. As we highlight above, this apparent bias might be due to the limited interest or knowledge of stakeholders about species of conservation concern, ecosystems and natural forest disturbance regimes. However, the phrasing of our main interview and focus group question focused on the contribution of forests to local stakeholders' wellbeing, businesses, and community, which may also have primed responses towards instrumental values regarding the local landscape. Moreover, it is possible that the use of the SESF to structure our results may have contributed to the apparent underreporting of biophysical factors in our results. Although it is designed to offer a comprehensive view of both social and biophysical dimensions of complex adaptive resource systems (e.g., de Vos et al., 2019), some studies have highlighted that the SESF itself might be biased towards social system factors compared to the biophysical system (Partelow, 2018).

Second, we used a data-driven, iterative, open-coding method to identify themes. However, the nested nature of some concepts led to overlapping data that could fit multiple themes. For instance, the social values of forests might encompass tourism and knowledge (Fredman et al., 2023), yet we treated these as separate themes. Similarly, some factors attributed to *collaboration* and *opinion-building* themes might have been coded within the *municipal sector* theme.

Third, while network analysis can mitigate unconscious biases in interpreting causal data (Montibeller and Belton, 2006), its accuracy declines predictably with the amount of missing or erroneous data (Borgatti et al., 2006, p. 124). We addressed this by including a diverse range of stakeholders across multiple sectors and governance levels, allowing respondents to discuss issues at length to minimize the influence of a priori assumptions. While we do not delve deeply into system dynamics beyond this network analysis, our holistic focus on causal relationships is essential for understanding the complexities of governance and management in forest landscapes. This is particularly relevant given the increasing recognition of systemic complexity as a constraint to effective governance (Dawson, 2019; Emerson et al., 2011; Pahl-Wostl et al., 2012), highlighting the need for an empirically grounded understanding of the causal mechanisms and structural interconnections that underpin these systems.

Fourth, the number of key factors identified is partly an artefact of the threshold set on importance scores; different thresholds yield different numbers of key factors. Our analysis aimed to distil the many

factors discussed by respondents into a core subset based on a quantitative analysis of their combined causal relationships rather than a purely qualitative analysis. Consequently, we set a high threshold, identifying roughly 7% of final nodes as key factors. Finally, our approach centres on the topological characteristics of the causal network, i.e., its structural complexity (Montibeller and Belton, 2006; Oliva, 2004), without assessing the quality of the causal relationships. Additional analyses are required to elucidate and prioritize decision-making options based on the identified key factors (Crielaard et al., 2023). These analyses may encompass leverage point analysis (e.g., Meadows, 2010), loop analysis (e.g., Abram and Dyke, 2018), fuzzy quantitative modelling (e.g., Kok, 2009), and system dynamics modelling (e.g., Sterman, 2000).

6. Conclusions

Reflecting a broader trend across Europe, where local communities increasingly seek to balance economic development with ecological and social objectives, this study explores stakeholder interests connected with the development of multifunctional forest landscapes (MFLs). Municipalities, tourism entrepreneurs, and rural residents were shown to play a crucial role in shaping alternative visions for the case study landscape in Tiveden, Sweden, and were linked to multiple factors driving change in the social system. In contrast, forest management stakeholders were perceived to adopt a utilitarian perspective, driving changes in the biophysical system to support an efficient cropping system.

Our study identifies significant constraints to bottom-up collaboration towards MFLs, many of which are echoed in forest landscapes across Europe and globally. These include the lack of trust and persistence of conflicts among forest landscape stakeholders, the critical role of economic functions for local communities, and the negative impacts of clearcutting on biodiversity and sectors reliant on cultural ecosystem services. Moreover, our study reveals crucial power asymmetries in forest landscapes, exacerbated by strong land ownership rights, institutional legacies supporting conventional intensive forestry, and the multi-level coalitions of large-scale forest management and industry actors. In Tiveden, imbalances among stakeholders resulted in a largely one-sided collaboration, despite efforts to develop a shared vision for MFLs, and a collaborative management platform for implementation.

Given the often-adversarial framing of relationships between prospective and incumbent forest users – where the former have everything to gain and the latter everything to lose – it is not surprising that large-scale forest owners may be reluctant to engage in collaborative initiatives. Supporting Hölting et al. (2020), our findings indicate a need for systemic changes to support a transition towards MFLs. These concern: the development of shared visions and objectives across socio-economic sectors and administrative levels; stronger focus on developing and sharing knowledge supporting MFLs, especially values and functions that are not linked to wood production; better inclusion of “non-influential” groups such as residents, recreational users, and prospective commercial users; the need for polycentric governance to ensure adaptation of higher-level policies to local contexts while engaging more diverse groups of stakeholders in decision-making processes (Lazdinis et al., 2019); and strong cross-sectoral ties linking actors of different kinds to avoid “us-and-them” collaborations that amplify differences between different coalitions (Bodin et al., 2016). These recommendations inform broader debates on transformative forest governance across Europe and internationally, where the integration of diverse stakeholder perspectives is crucial for sustainable forest management, and underscore the need for stronger inclusion of social and justice perspectives (Kleinschmit et al., 2024b).

CRedit authorship contribution statement

Lucas Dawson: Writing – review & editing, Writing – original draft,

Visualization, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Per Angelstam:** Writing – review & editing, Project administration, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no competing financial interests or personal relationships that could have influenced the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.forpol.2026.103724>.

Data availability

Data will be made available on request.

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