

Bridging Social Innovation with Forest and Landscape Restoration

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Abstract

Mitigating climate change, preventing mass species extinctions, improving rural livelihoods, and disaster risk reduction are among today's most urgent challenges. To meet these challenges, a large number of social actors need to agree to engage and act collectively on Forest and Landscape Restoration (FLR), ensuring its dual goal of restoring ecological functionality and improving people's wellbeing. Although FLR has gained momentum globally, the experiences so far continue to face socio-economic and governance challenges associated with the design and realization of effective efforts. Social Innovation (SI) can be seen contemporarily as the process and the result of interaction between stakeholders in the construction of solutions to social needs and problems, including those tackled by FLR. Here, using a content analysis approach applied to existing literature, we propose five possible conceptual bridges between FLR and SI. The Social Innovative – Forest and Landscape Restoration (SI-FLR) process advocates that sustainable livelihood needs should be attended first to ensure the Social-Ecological Systems' resilience. These bridges are: (1) “Landscape as the main context”; (2) “Nature as social need”; (3) “Landscape stewardship groups”; (4) “Governance capabilities”; (5) “Adapting and transforming to enhance resilience.” Identifying these bridges, will help decision-makers and project managers to improve the FLR initiatives by supporting the potential of SI and sparking the interest of other researchers to explore the many possibilities of SI-FLR.

KEYWORDS

ecosystem stewardship, governance, landscape approach, Livelihood Resilience, Nature-based Solutions, Nature's Contribution to People, Social-Ecological Innovation, Social-Ecological System

1 | INTRODUCTION

Climate change crises, biodiversity loss and disaster risks for rural livelihoods are among today's most urgent challenges. The search for solutions to alleviate this scenario is aligned with the recognition of Nature's Contribution to People (NcP) (IPBES, 2019), demanding a

large number of social actors to adopt Nature-based Solutions (NbS) (Cohen-Shacham et al., 2019) for mitigating-adapting to climate change, improving Livelihood Resilience (LR) (Tanner et al., 2015), protecting biodiversity, and supporting disaster risk reduction (UN, 2015). FLR is a NbS that aims to regain ecological functionality in landscapes while improving human wellbeing (Lamb, 2005).

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Despite several successful experiences in FLR (Hanson et al., 2015), many obstacles remain regarding technical aspects, financial mechanisms, progress measures, and governance (Chazdon et al., 2020). Rarely are implementation cases able to fully address the social-ecological goals of FLR (Ota et al., 2020). The FLR process requires a complex translation of local restoration needs and degradation drivers into a long-term engaging and adaptable theory of change (Soe & Yeo-Chang, 2019). FLR's approach focuses on maintaining and restoring ecosystems, promoting sustainable agri-food systems (Feenstra, 2002), and improving other landscape functions, requiring trust and engagement among stakeholders. Such an approach may entail well-organized participatory governance (Giessen & Buttoud, 2014) that seeks feasible agreements and adaptive processes supported by the local communities that lastly trigger Social Innovation (SI). SI refers to any processes or outcomes where mobilized people share ideas and knowledge and engage in collective actions to come up with adjustments in social institutions, or new ways of managing natural resources to overcome a specific common challenge (Murray et al., 2010). Although considered a driving force for sustainable improvements in many fields, SI research in forest restoration is just beginning.

Social-Ecological System (SES) provides a context for interconnecting and aligning SI and FLR (Berkes et al., 2000). While it is known that various exogenous and endogenous social, political, ecological and economic factors can motivate communities to take a leading role in FLR (Paudyal et al., 2017), there is insufficient understanding of how these factors can promote FLR implementation (Sayer et al., 2013). We aim to identify conceptual bridges that describe potential convergences between basic concepts used to explore SI and FLR. This analysis can reveal new ways to achieve shared goals, recognizing that enhancing NcP and LR are the main expected impacts of both SI and FLR, and to explore Social Innovative – Forest and Landscape Restoration (SI-FLR) as an emerging FLR approach. Below, we review the underlying conceptual grounding of the key concepts mentioned above, describe the methodology, present, and discuss the possible bridges between FLR and SI, and conclude by summarizing key messages.

2 | CONCEPTUAL BACKGROUND

2.1 | Social-Ecological Systems (SES)

SES is a framework to assist systematic thinking to understand how social-ecological interactions shape landscapes across space and time (Ostrom, 2009). This approach centers on the users of resources rather than on natural resources themselves (Berkes et al., 2000). The SES represents the assets and processes of the interconnection between human society and biophysics subsystems, coupled with reciprocal feedback cycles (Liu et al., 2007), recently conceptualized through the idea of ecosystem services. The outcomes of the relationship return as input, influencing the system's dynamic stability as a whole, strengthening its resilience or contributing to its transformation to a new

status. Through local agents' actions, organized behavior can transform macro-scale social-ecological mechanisms by creating feedbacks within the system and influencing the behavior of these same agents. The ecological feedbacks generally occur more diffusely and slowly than social agents actions (Levin et al., 2013). Intensive feedback mechanisms, such as natural disasters, extreme events and long-term political disturbances can lead SES to a tipping point, in which the supporting ecosystem degrades, ecosystem services decline and the local people can lose their agency (Fernández-Manjarrés et al., 2018). SES produces wicked problems, such as degraded landscapes and socio-economic crises, offering a fertile ground for FLR and SI.

2.2 | Forest and Landscape Restoration (FLR)

FLR's approach is built on Ecological Restoration (ER), but differs in key ways. While ER is an intentional action to accelerate ecosystem recovery in a specific degraded site (Higgs, 1997), FLR is based on a "landscape approach" which aims to balance social, economic, and environmental needs in places where agriculture, mining, and other productive activities compete for space with nature. Landscapes are the arena where its elements, including people, interact according to physical and biological properties and dynamics. Landscapes provide the spatial context of social institutions that determine roles and relationships (Sayer et al., 2013). FLR focuses on increasing the socio-ecological resilience and socio-biodiversity connections through dialog with the stakeholders using and living in the landscape (Chazdon et al., 2020), which is also a sufficiently large scale for different socio-economic and ecological aims to be sustainably balanced.

Over the last decade, FLR has gained momentum, becoming an important topic in international environmental agendas. Currently, many countries are voluntarily committed to restoring more than 170 million hectares of degraded forest landscapes under the Bonn Challenge (ibid.). In 2021 started the United Nations Decade of Ecosystem Restoration promising to scale-up both FLR and ER efforts.

2.3 | Social Innovation (SI)

SI can be seen as the process and the result of interactions between actors in the construction of solutions to social needs (Neumeier, 2017). Within a SES, SI can be triggered by approaching a situation (e.g., soil degradation) that is no longer acceptable for the community or confronting new opportunities or limitations (e.g., new regulations or market requirements). When SI frames new strategies, ideas, concepts, processes, institutions or organizations capable of enhancing NcP, it can be termed as Social-Ecological Innovation (Olsson & Galaz, 2012).

A specific definition for SI in marginalized rural areas, such as those where FLR typically occurs, has been recently proposed (Polman et al., 2017) and applied in forest restoration (Soe & Yeo-Chang, 2019). It identifies three criteria to assess whether a process or an output is a SI: it has to (1) have some reconfiguration of the

social practices (e.g., networks/institutions/governance); (2) be newly initiated within a geographical boundary, context or social group; (3) actively and voluntarily engage the local civil society.

2.4 | Livelihood Resilience (LR)

Livelihood frameworks encompass the capital assets, capabilities, management of risk factors, the political context, and the institutions capable of improving or hindering different means of living (Scoones, 2009). Natural resources are vital for social and biological functions of rural livelihoods (Ellis & Allison, 2004). These are resilient when they resist to exogenous shocks and stresses, are independent of external assistance, capable of maintaining their assets for long-term, and do not harm other people's livelihood choices (Serrat, 2017).

Integrating a political goal to SES, LR is defined as the capacity of rural people to resist, adapt, and transform their capacities and assets; to maintain and improve their quality of life despite disturbances and SES feedback mechanisms (Tanner et al., 2015). Sustainability-oriented strategies and projects should first address the livelihood needs that sustain SES's general resilience. The vulnerability of livelihoods associated with particular rural SES should be reduced by actions promoting their wellbeing (Mallick, 2019).

2.5 | Nature's Contribution to People (NcP)

Costanza et al. (1997) revealed that global natural capital's annual economic value exceeds more than twice the World's annual GDP. The Ecosystem Services (ES) concepts strengthened advocacy for nature's benefits to human welfare, drawing global attention to social dependencies on ecological systems by using economic language (Quintas-Soriano et al., 2018). The Millennium Ecosystem Assessment (MA, 2005) presented econometric analyses reinforcing the positives linkages between ES and people's wellbeing: ES were organized in categories (supporting, provision, regulation, and cultural), embracing also intangible values (e.g., spiritual). The main criticisms on this anthropocentric approach rely on a prevailing economic and simplistic vision that assumes a necessary interconnection between the services offered by nature and demands of society, which sometimes does not occur (Fedele et al., 2017).

To overcome these issues, the more ontological and pluralistic NcP framework was proposed (IPBES, 2019), amplifying the ES scope and incorporating non-Western narratives on human-nature interactions. It diversifies the narrow economic focus of ES, including other social sciences, recognizes the central role of culture and local/indigenous knowledge and considers negative contributions to the life quality of human beings.

3 | METHODOLOGY

This paper is a literature review, systematically analyzed to deductively identify conceptual bridges between FLR and SI occurring

within a SES. We applied a content analyses through text mining techniques using MAXQDA Analytics Pro 2020 (Kuckartz & Rädiker, 2019). The literature search was performed using the SCOPUS database, which is used by social and political scientists in forest-related fields (Arts, 2012). Scientific papers published from 2000¹ to 16.02.2020 were filtered by keyword strings (Table 1) to capture the main guiding concepts from which our analyses began: SES, FLR, and SI.² A fourth category named “connectors” was created to assist the parameterization of the literature search, aggregating keywords of expected connection among the three main categories (Table 1). All keywords were searched on titles, keywords, and abstracts.

In total, 36 scientific articles were selected and analyzed, 18 connecting SI, SES and “connectors” categories, plus 18 connecting FLR, SES, and “connectors.” No document was found bridging FLR and SI directly. All these selected articles are identified in the references with an asterisk mark.

The selected papers were analyzed in chronological sequence, following the concepts' evolution. They were distilled in higher categories (e.g., “Means of measurement”) and related concept-codes (e.g., “Criteria,” “Methods,” “Frameworks”), which guided the analysis (Figure 1). In some cases, Boolean lexical searches were used to locate more complex sentences, which were interpreted and assigned to the most appropriate concept-code. Here we take the simpler and more evident routes on bridging FLR and SI, and do not explore other possible but less visible conceptual connections.

With the support of MAXQDA functions, concept-codes were continuously reorganized into higher categories, mimicking some of the frameworks found in the reviewed literature.³ This process enabled a deeper understanding of meanings, and it resulted in the deductively extracted topics presented in Section 4. The analysis used a problem-solving oriented approach, following key guiding questions aimed to disentangle the theoretical components of the SI-FLR process, from the problem identification to the effects of solutions, namely: “where” the problems arise, and the solutions can be performed; “why” solutions are necessary (which social needs should be

TABLE 1 Field of study, keyword combinations and the number of publications found from 2000 to 16.02.2020

Field of study	Key word combination	Number of publications found
Social-Ecological System	“social-ecological system,” “eco-social system,” “social-eco system”	257
Forest and Landscape Restoration	“landscape restoration,” “landscape management,” “forest restoration”	297
Social Innovation	Social Innovation, Social-Ecological Innovation	117
Connectors	“governance,” “social capital,” “stakeholder,” “social network,” “new beliefs,” “new attitudes,” “adaptive management”	295,613

(e.g., governance structures) characteristics, and their drivers (Zasada et al., 2017).

From a political point of view, territories delimit a specific power form, a higher hierarchical level of government aggregating unit than landscape, resulting in specific spheres and standards of the ruling (Gibson et al., 2000). Because of less formal structures and proximity to livelihoods, the landscape's collective-choice arena is faster and more flexible to adapt its operational rules than higher political spheres on adjusting coexistence rules.

The landscape-based boundary contributes to a better understanding of context, capturing “the manifold dimensions of places where people live and work” (Angelstam et al., 2017: 300). It is at the landscape level that ecological and social systems operate interdependently, connecting past and future of people and nature (Prager, 2015).

While each landscape is unique, scholars often refer to them in categories that share common elements. In that sense, natural landscapes are places mostly covered by natural ecosystems (e.g., forests, grasslands) and hosting nature-based livelihoods, which have been widely replaced by human-modified landscapes (Bohnet & Konold, 2015). Agricultural landscapes (Townsend & Masters, 2015) are designed as agri-food production systems to cater to the demands of a complex society, which manages the land through technologies, markets, and policies. When a landscape degrades, its sociopolitical context may favor restoration interventions (Gamborg et al., 2019) that, eventually, transform it into a multifunctional landscape (Cockburn et al., 2019).

Landscapes can also be classified as rural, peri-urban, or urban. Whereas the rural landscape is the primary locus for FLR initiatives, SI tends to emerge more often in urban landscapes (McPhearson et al., 2015). In the latter, a greater variety of situations and social capital contributes to diversify the “windows of opportunity” (Westley et al., 2013) for transformative processes and “provide far better opportunities for scaling up the impacts of grassroots initiatives” (Wolfram & Frantzeskaki, 2016: 7), because they “connect consumers, producers and policy, thus co-shaping urban lifestyles and global consumption patterns” (ibid: 6).

Social-Ecological Innovation (SEI) can come up with solutions out of FLR conceptual boundaries to improve SES. For example, stimulating knowledge exchange between FLR initiatives with grassroots green movements expands local cultural diversity, contributes to social learning; sharpens reflective thinking; incites experimentation of new ways of living with the landscape; expands networking, and promotes producers-consumers direct channels, encouraging SEI emergence (Dennis et al., 2016b).

Historically, landscapes have been shaped by economic and cultural changes. Today, landscapes are more interconnected, interdependent, and paradoxically less prepared to absorb unexpected environmental events (Bohnet & Konold, 2015).

4.2 | Bridge 2: Why does SI-FLR happen? “Nature as a social need”

Improving people's wellbeing is a trigger and one of the primary outcomes sought by FLR and SI. Often used to design and monitor the

effects of social policies, the wellbeing concept has provoked divergent debate, as it aggregates objective and subjective characteristics, which can vary according to culture, life history, physical, psychological and economic conditions (Stiglitz et al., 2009). Nature is the ultimate source of wellbeing from which people discover, explore, manage, combine, and transform its elements, sceneries, and resources to improve their livelihoods (Angelstam et al., 2017). Forests, for example, are the place to live, the resource provider, and cultural heritage for the communities that inhabit them (Balázi et al., 2019). However, for the majority of dwellers, wellbeing is also weighted by distinct values and socioeconomic factors that invoke other immediate social needs (e.g., income, housing, infrastructure, employment), which implies distinct land-use typologies (Angelstam et al., 2017). Non-forest-based dwellers also recognize the importance of nature for their own quality of life (Quintas-Soriano et al., 2018). The social need for NcP's changes over time and space, according to contextual conditions (e.g., crises) and the landscape's intrinsic features (e.g., demography, land-use) (Rodima-Taylor, 2012).

Many of the ecological feedbacks resulting in social-ecological deprivation are caused by social agents' actions that take time to be perceived and understood, due to processes of cascading effects (Fedele et al., 2017). However, changes in the context and landscape's intrinsic features can favor the connection between local social needs and multi-scale and sectoral demands for NcP, strengthening the local-regional agents' network in an effort to search and develop SEI (Castro-Arce & Vanclay, 2019). Depending on the path taken, emerging SEI can trigger or propel a SI-FLR process.

Two examples illustrate this. The first is when a threat to ecosystem services is perceived as the cause of damage to wellbeing and people mobilize to transform this situation (Cockburn et al., 2018). For instance, the reduction in crucial ecosystem services supply caused by flora-fauna composition changes together with water scarcity provoked a *long-lasting national restoration program* in South Africa (Cockburn et al., 2019). The second example is when knowledge about nature is co-produced, facilitating the adaptation to changing environmental conditions. For instance, the identification of adaptations to improve the wellbeing of people living in *grass-based ecosystems in transition* in France (Lavorel et al., 2019).

Ecosystem and adaptation services can coexist awakening distinct interests, depending on the social agents scale of action (Gibson et al., 2000). For example, farmers and the local rural extension company would likely be more interested in adaptation, while residents of a nearby urban center and the regional environmental agency in ecosystem services. Both seek wellbeing improvement, yet this outcome will only be achieved when their attitudes are adjusted to circumvent the challenges (ignorance, mismatch, plurality) to cooperate in a cross-scale and level strategy that is articulate different social-environmental needs and services (Cash et al., 2006).

4.3 | Bridge 3: Who does this transformation? The “Landscape stewardship groups” (LSG)

Both SI and FLR are human-centered processes. People act intentionally, alone or collectively, to exploit resources and this differentiates



social from ecological systems (Heslinga et al., 2017). The capacity to act depends on beliefs, interests, and power to manage the structural forces of domination and legitimation as institutions and norms (McCarthy et al., 2014). A landscape steward is a person or group of people, who deliberately act to maintain or (re)shape the landscape according to their wishes and possibilities (Raymond et al., 2016). A SI-FLR landscape-scale transformation will only take place when there is a combination of favorable context, and a qualified steward willing and empowered to make the change occur (Palomo et al., 2017).

Once social norms, beliefs and practices are embedded and influenced by the prevailing cultural hegemony, the capacity of some actors to reflect on the role and impact of the established institutions is a fundamental element to trigger a LSG (Moore et al., 2018). As local people are directly affected by the social and ecological elements and history of the landscape, they are usually aware of local limitations and opportunities and, thus, their reflexive capacity is connected to the local reality and needs; their ideas tend to be more tied to local social structures (Kim et al., 2017), and their livelihoods are more connected to the use of local resources (Quintas-Soriano et al., 2018). Intermediary organizations are crucial in strengthening local social capital, supporting LSGs to create relationships of trust between agents of various scales, acting as brokers of connections, resources, and knowledge (Brown, 1991).

Landowners, rural workers and communities, and their networks are central actors influencing landscape conditions and potential LSGs (Zasada et al., 2017). Forestry, mining, and agribusiness companies are relevant actors who, together with local governments and regional agencies, impact the landscape design (Prager, 2015). Non-local residents' choices and demands can also affect it.

The tension between the LSG desire for change and the conservative forces of existing social structures continues until a "window of opportunity" (Biggs et al., 2010) arrives. At this moment, for a certain period, LSG will assuming the resources and the power to remodel the landscape. When this new vision is built in a participatory manner aiming to a legitimate social demand, it can be named Social Innovation (Nijnik et al., 2019). When it also targets to enhance NcP it can be a Social-Ecological Innovation (SEI). However, a LSG's vision may not necessarily be a SEI; and a FLR initiative does not constitute a SEI when imposed by a specific law or market force in a top-down manner, responding to the will of dominant social groups. Yet, even when not established as a SEI, FLR can create favorable conditions for its future emergence through governance and management mechanisms.

A key LSG's characteristic is the voluntary disposition of people to participate (Cockburn et al., 2019), a crucial condition being that participants are aware of the rights to access natural resources for their livelihoods (Melnykovich et al., 2018). In addition, a minimal level of social, political, and financial capitals is needed to support its self-organization. Effective local leaders are also vital for mobilizing people (Dennis & James, 2018).

LSG represents a unit of ecosystem stewardship, which is the strategy to manage uncertainties and reconfigure SES, whose future is in constant dispute (Cockburn et al., 2019). The interaction, diversity, trust and power balance between the LSGs units involved in the land-

use planning and managing will influence the future landscape design (Fedele et al., 2017).

Therefore, a stewardship system favorable to increasing NcP and RL can be achieved through the construction, restoration, and strengthening of human and social capitals within a LSG towards a SEI. The collaboration and engagement required to perform the set of landscape restoration activities improve social cohesion (Angelstam et al., 2017). When successful, an SI-FLR approach can positively impact wellbeing, inspiring people to search for more resilient livelihoods, connected to the *Buen Vivir*⁴ principles (Acosta Espinosa, 2008). Civil society can engage in many FLR phases: from diagnosing, monitoring, and managing activities to the seed collection, seedling production, and planting.

The landscape transformation pathway through SI-FLR is linked with reconfiguration of local economies, social relations, and power distribution, and seeks at improving the natural and social capitals and enhancing political-economic and ecological resilience. Social movements guided by agroecological principles have demonstrated that it is possible to articulate individual practices within collective political actions to reshape their own landscape and social-cultural context, reverberating in other neighbor's mobilization (Herrmann et al., 2018).

The design and implementation of FLR processes by formal state entities generally lacks consideration of local livelihoods (van Oosten et al., 2019), potentially explaining the low LSGs commitment to fostering FLR implementation and their sudden collapse right after a short and insufficient funding cycle. Accordingly, SI-FLR initiatives should be flexible enough to align with local needs and build on landscape governance and NcP, be contextual and continuously improved through praxis to understand SES limitations and opportunities. This approach tends to enhance the SES resilience and local community autonomy in the long-term, and will demand and promote innovative and transformative power (Avelino, 2017) to accommodate the FLR vision, adjusted by LSGs.

4.4 | Bridge 4: How does SI-FLR develop? "Governance capabilities"

In an FLR process, deciding what, where, how, for whom, and by whom to restore should be the responsibility of the landscape governance, which implies continuous negotiations between stakeholders within a large institutional environment (van Oosten et al., 2019). Governance is not necessarily a formal structure, it can house informal organizations and poorly defined administrative processes, which can compromise communication and generate legitimacy problems (Rodima-Taylor, 2012).

Governance principles are associated with a normative approach, and imply value judgments on desirable conditions (Giessen & Buttoud, 2014), including: efficiency, transparency, participation, accountability and capacity. Appropriate governance conditions are considered supportive to the necessary institutional environment for stakeholders to negotiate and implement a plan to redesign land-use in degraded landscapes, transparently and democratically, fostering

the connection between local social needs and NcP (van Oosten et al., 2019). This can also enable socioeconomic and political conditions for SEI emergence, which in turn can improve the efficiency and effectiveness of FLR, contributing to larger social-ecological outcomes (Castro-Arce et al., 2019).

While not strictly referring to governance principles as applied in forestry, we have been inspired by them in identifying four governance capabilities. As key features of resilient SES, at the basis of the bridge, they are deepened hereafter.

- i. *Trust-building*: The success and quality of any transformative social-ecological process rely on the level of trust and integrity among stakeholders (Castro-Arce & Vanclay, 2019). The continuous search for information, either from secondary sources or ad hoc monitoring and evaluation systems, and its proper utilization in supporting decision-making, is basic to create trust (Elmhagen et al., 2015). Equally, it includes transparency about data collection and its reliability and how decisions are taken, how resources are allocated, and what results are obtained (Westley et al., 2013). Besides, participatory spaces for knowledge-sharing, building proposals, and decision-making contribute notably to collaborative learning and trust-building, enhancing human and social capital, local capacity to adapt and transform, improving SES resilience (Biggs et al., 2010).
- ii. *Self-organization*: Governance is formed by self-organized networks of people who use different knowledge and experiences to structure an understanding about complex problems, design policies, and gather resources to act in favor of collective interests (Folke et al., 2005). Leadership is crucial in bringing people together and keeping them self-organized (Biggs et al., 2010). Respect is a crucial democratic principle for any self-organized process, connected to the right of distinct social groups to express themselves without discrimination, diversifying knowledge and perspectives and increasing the possibility of innovative solutions (Sarkki et al., 2019). Equally vital are the considerations about the “(ab)uses of power” (Mustonen, 2013), since each person or organization defends its own interests and can act as sector representative. To maintain social cohesion, it is also essential to promote vigilance over the rules that enable internal redistribution of power, since changing institutional roles, responsibilities and authorities is part of the governance game and can benefit to the group as a whole (Moore & Tjornbo, 2012).
- iii. *Adaptability-flexibility*: Understanding environmental flows and socioeconomic changes in the SES allows more precise actions to adjust approaches rapidly. Thus, governance should focus on a particular landscape and well-known local context, where it is possible to identify the key stakeholders and, somehow, measure the available local resources (Folke et al., 2005). Flexibility can be enhanced by social learning. New knowledge can be promoted by boosting local actors to investigate/experiment with their ideas in the same landscape (Wolfram & Frantzeskaki, 2016). A polycentric approach may increase the adaptive capacity of governance once it diversifies the perspectives and brings the local

realities closer to decision making (Dennis et al., 2016a). This applies in forest landscapes too (Melynkovich et al., 2018), but its practice is very challenging, as it requires time, resources, and the right people to create the confidence, relationships, and reflections. Similarly, SI is an adaptive process influenced by beliefs, social structures, and power vectors, which may vary over time and even completely change its goals while obtaining the necessary political power to be implemented (Fougère & Meriläinen, 2019). Its outcomes may prejudice some social groups or the SES as a whole, emerging as a dark side of a poorly managed SI-FLR.

- iv. *Bottom-up-linked*: It refers to a governance approach where an active process of SI bridges social groups, geographies, and sectors together while gaining scale and influencing regional transformation (Castro-Arce & Vanclay, 2019). Spatial planning, co-management and polycentric governance are key instruments to connect social-political levels in different spatial scales with wider structures, making the process fluid, inclusive, transparent, and effective. Yet, this approach might be negatively susceptible to “institutional externalities”⁵ (Mewhirter et al., 2018), favoring elites remaining in power through local cronyism and corruption. Abilities of network enabler, knowledge and resource brokers, conflict resolution agents, and shared vision creators can reduce this susceptibility.

These four Governance Capabilities indicate a flexible path to take adaptive and transformative decisions, and have potential for contributing to overcome barriers to undertake effective SI-FLR processes. Governance Capabilities can enable SEI emergence in a FLR context, by identifying local needs to redesign it, increasing social participation and local community empowerment, generating new multi-scale integrative solutions and amplifying FLR social outcomes. The final impacts of this transformation are rarely measured empirically.⁶ They are influenced by seven drivers: politics, economics, ecology, society, culture, technology, and demography (Wolfram & Frantzeskaki, 2016). The landscape governance is a responsive subsystem within a more complex and less visible social system.

4.5 | Bridge 5: What is the expected impact from SI-FLR? “Adapting and transforming to enhance resilience”

The dynamic stability of any sustainable landscape depends on the outcomes of three key attributes: resilience, adaptability, and transformability. They are linked to the “adaptive cycle,” a conceptual tool that explains complex, multi-scalar SES processes in four phases (exploitation, conservation, release, and reorganization) (Walker et al., 2004).

Resilience and adaptation mirror the upkeep or incremental adjustments to the system. Transformation, instead, implies radical innovations, usually stochastic, a period of chaos followed by profound changes with uncertain outcomes. In some contexts (e.g., low NcP and many marginalized people), resilience is not desirable and

small adjustments may be irrelevant; although less socially palatable, sometimes transformation is the best choice and, political, economic, and social bumps occur along the way (Westley et al., 2013). In a SES approach, ecological processes and their outcomes for people are equally important to the socioeconomic and political dynamics, and to explaining the complexity and transformations along the time (Walker et al., 2004).

When applied as an attribute of the SES, the specific resilience (Folke, 2016) has been criticized for representing a unidirectional concept, built to give an ecological and biophysical perspective to landscape management in response to disturbances, disregarding the power game among the social groups and depoliticizing disputes and tensions (Heslinga et al., 2017). The concept of general resilience (Folke, 2016) refers to the dynamic stability of the adaptive cycle as a whole, thus including the capacity of people, communities, societies, and cultures to adapt or transform themselves, turning crisis into opportunities to change. As the SES change over time, general resilience depends on the intensity and quality of the undergoing innovations.

Both FLR and SEI can enhance general resilience by adapting or transforming some SES elements, subsystems, or the whole system. In degraded landscapes, marginalized rural people can be empowered by SI processes and lead profound societal changes by challenging, altering and replacing current dominant institutions, in a transformative Social Innovation (Avelino, 2017). While social-ecological degradation has been the main driver of landscape transformation in recent years, SI-FLR could be the transformative Social Innovation process needed, by suggesting other paths to restore local social-ecological interactions (Cowie et al., 2019).

4.6 | General considerations

Whereas FLR acts by planning and implementing effective landscape configurations to accommodate sustainable agri-food production systems with NcP, SI focuses on reconfiguring social relations and structures to include marginalized people by adjusting or transforming people's attitudes and demands towards SES and, consequently, influencing landscape design. Therefore, SI and FLR can be complementary in promoting land use local-global adaptive and transformative processes. To be successful, both FLR and SI should connect meaningful local realities to multi-scale governance contexts. When the established governance system fails to satisfy local needs, and marginalized people are pushed to self-organize and develop solutions for enhancing their wellbeing, then these people become social innovators (Melnykovich et al., 2018). In a favorable context, when their needs are associated with NcP improvement, they are one step closer to becoming a Landscape Stewardship Group (LSG) towards a SI-FLR approach.

SI-FLR transformation processes are undertaken by LSG (Bridge 3), who organize themselves with other social actors through four basic governance capabilities: trust-building, self-organizing, adaptability-flexibility and bottom-up-linking (Bridge 4). LSGs put

actions in course to change the landscape with the aim to enhance its general resilience through adaptive and transformative attitudes (Bridge 5). These steps are visualized in (Figure 2) and we believe it helps to describe real examples, such as the Xingú Seed Collectors Network in Brazil (Box 1).

BOX 1 The five bridges of SI-FLR applied to Xingú Seed Collectors Network in Brazil

In this case, indigenous people perceived deforestation as a threat to their water resources and wellbeing (Bridge 2). Supported by a linking institution, they self-organized to assist the surrounding farmers to restore their landscapes (Bridge 1), offering forest restoration services and products, thus acting as local LSG (Bridge 3). After a long process of social learning and reflexive thinking, a Social-Ecological Innovation emerged, the creation of the Xingú Seed Collectors Network (Bridge 4). After 10 years, the current Network is composed of more than 550 seed collectors, have produced more than 200 tons of seed, generating more than US\$ 1.3 millions as income to the indigenous communities, while supporting forest restoration and thus improving the overall resilience of the social-ecological system (Bridge 5) (Urzedo et al., 2020). In this case, it is worthwhile to mention two SI-FLR enabling factors: (1) the context, landowners being pressured by market and environmental law to restore their lands, and (2) the governance capabilities, working of connecting local seed collectors to multilevel actors.

SI-FLR can be triggered in two main ways. In one way, when a SEI, like the Xingú Network, moves towards a FLR process, a local networks of seeds collectors act as LSGs. They self-organize and assume the responsibility to plan, execute, and monitor the course, supported by intermediary institutions that act in cross-scale and cross-level governance environments, sparking a bottom-up-linked SI-FLR process. In the other way around, a top-down-driven FLR (e.g., activated by a public funding program) can also provide a fertile ground for SI-FLR emergence. This may happen when local needs for NcP are identified, LSGs' experimentation towards SEI is supported, and a window of opportunity is opened to promote social learning while empowering and legitimate local authorities to take decisions. This second way could be prompted by a broader strategy, such as for example a Disaster Risk Reduction plan to action, once the SI-FLR contribute to the four priorities established by the Sendai Framework for Disaster Risk Reduction (Sendai's FP in the following) (UN, 2015). The adoption of the landscape as the main context (Bridge 1) is crucial to the understanding of all dimensions of vulnerability, capacity, and disaster risk exposure (Sendai's FP 1). The coherence among national-local

Bridge 1: Where can SI-FLR occur? 'Landscape as the main context' (local to regional)

Landscape:

- Is where the resources, local livelihood, direct beneficiaries, risks and opportunities sit
- Is where people experience and build managements practices of SES, shaping believes, socio-economic relationships, and ties with nature

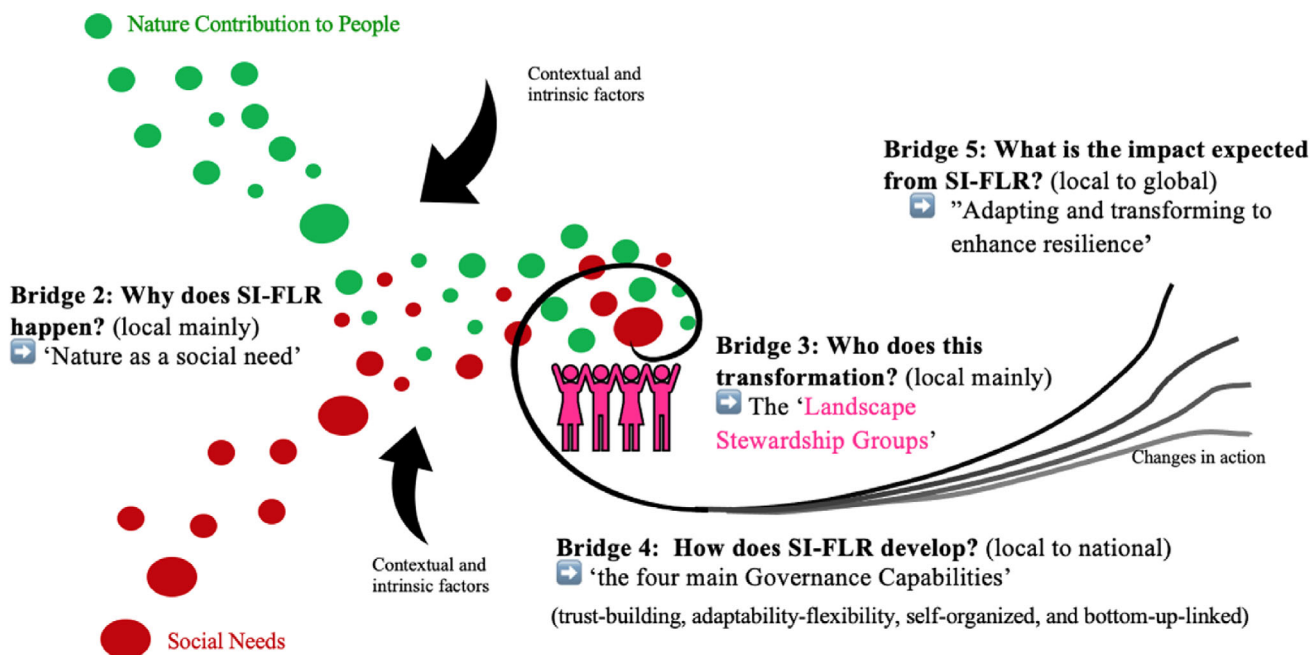


FIGURE 2 The Social Innovative – Forests and Landscapes Restoration (SI-FLR) process [Color figure can be viewed at wileyonlinelibrary.com]

institutions (Sendai's FP 2) can be facilitated by the adoption of the governance capabilities (Bridge 4). Sendai's FP 3 highlights the role of innovation in driving planned disaster risk reduction investments to improve the overall resilience of the landscape, directly connecting to the impact expected by SI-FLR (Bridge 5). Finally, the connection between local needs and NcP (Bridge 2), the LSG empowerment (Bridge 3), and the proper governance capabilities (Bridge 4) are supportive to enhance the capacity for effective response, and "Build Back Better" actions (Sendai's FP 4).

In any direction, the general resilience of a SES tends to improve when the Governance Capabilities are put in practice, and when local groups of motivated people decide to react to a challenge with a new solution, that is often both social and environmental in focus (Avelino, 2017). Both the social agents and the institutional conditions are essential factors that should act in synergy within site-specific environmental conditions. For example, a real increment in native vegetation cover due to factors that somehow prejudice the local socio-economy does not necessarily contribute to the general resilience improvement expected as the major SI-FLR impact. This can be the case of the decline in agricultural activities that has led several European landscapes to regain native vegetation (Pereira et al., 2015). The perception of this dynamic by the local population can be negative, since it conflicts with the prevailing social memory about the land use history (Martín-Forés et al., 2020); natural regeneration represents an unwanted change, and not an option built by LSG, NcP are

disconnected from local social needs and from the broader understanding of wellbeing.

5 | CONCLUSIONS

Bridging SI-FLR specifies a distinct and possible novel approach to FLR, which brings the Social-Ecological Innovation as a driving, and desirable element for supporting sustainable rural livelihoods and restoring socio-ecological relationships on the landscape. Although the paper lacks empirical evidences through case studies, the identification of the five conceptual bridges demonstrates that intrinsic theoretical connections exist between FLR and SI. They have been briefly narrated in relation to two real examples, that is, the Xingú Seed Collectors Network (Brazil) and the Sendai Framework for Disaster Risk Reduction (United Nations), and seem to plausibly represent a real SI-FLR process. Our analysis reveals that the networking and vision-sharing mechanisms of self-organized LSGs, which are typical of SIs, are likely to accelerate or amplify FLR implementation. Vice-versa, the FLR implementation at landscape level based on regional demands of ecosystem services, key governance capabilities, and linking institutions can activate or intensify people's mobilization and transformative processes towards the improvement of wellbeing and SES resilience. By revealing SI-FLR possible interconnections, we believe have contributed to illuminate the key elements of the



countless FLR initiatives underway and yet to come, as well as to spark the interest of other researchers to delve into the mechanisms of the connections and the key aspects explore ways of supporting the design and implementation of effective SI-FLR, in both policy and practice.

However, many pending questions remain to be answered about SI-FLR, such as: What would be its types and formats? Where is it actually happening? For whom, in what situation and to what extent are its impacts? How can FLR funding enable SEI? What are the best variables to be empirically measured to demonstrate and quantify the social, together with the ecological, impacts? Responses to these questions can help to structure and conduct more inclusive FLR, in the sense of providing more attention and care towards the innovators who take action to improve rural people's wellbeing and the general resilience of forest landscapes.

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ENDNOTES

- ¹ We took 2000 as a starting point because it was when the FLR term was proposed by WWF and IUCN. Many years later, SI started to be studied in rural areas.
- ² Other two concepts “LR” and “NcP” have emerged during the content analyses. Apart from having been used to explain the bridges (Section 4), they have been incorporated in Section 2 to provide a more comprehensive conceptual background.
- ³ For example, social-innovation framework (Biggs et al., 2010); the multiple processes on SES subsystems (Moore et al., 2014); mediation mechanisms and factors in ecosystem service delivery (Fedele et al., 2017); and others.
- ⁴ *Buen Vivir* is a term, which represents the ontological conception of the life of the indigenous peoples from Latin America. It is a proxy for the modern-Western of “development” and “progress” concepts.
- ⁵ When a decision-making body influences the political environment of other forums in the system.
- ⁶ Because of the limited empirical evidences, we mainly refer to “expected” rather than “actual impacts” in Bridge 4.5.

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