Rethinking the diffusion of grassroots innovations: An embedding framework

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ARTICLE INFO

ABSTRACT

This paper conceptualises the ways grassroots innovations (GIs) influence sustainability transitions. While research on GI diffusion tends to use the three-pathway model (replication, scaling up and translation), this paper rethinks GI diffusion through the lenses of an *embedding* framework. We illustrate this framework by applying it to the empirical case of ecovillages in the Global North and South. The results show that GIs become embedded in wider society through different dynamics: expansion, reframing, circulation of knowledge, shifting material arrangements and replication. The embedding framework brings clarity to diverse dynamics of diffusion and is particularly able to grasp the cultural, cognitive, economic and environmental impacts of GI initiatives.

1. Introduction

Sustainability Transitions is a growing field of research which recognises that solutions to environmental problems require radical shifts to new kinds of socio-technical systems such as mobility, agri-food and electricity. These transitions are long-term and contested processes, involving changes in many dimensions such as infrastructures, technologies, policies, symbolic meanings and social practices. Therefore, they cannot be led by any single actor but require cooperation among different actors such as industries, businesses, politicians, academia and civil society (Köhler et al., 2019).

Literature on sustainability transitions has emphasised the importance of *niches*, protected spaces where radically new technologies and social practices can emerge and develop through experimentation and learning (Geels, 2002; Kemp et al., 1998). While the concept of niches initially focused on technological and market-based niches, in the last two decades another type of niche innovation has been increasingly recognised in research and policy: grassroots innovations (Hossain, 2016). Grassroots innovations (GIs) emerge from the bottom up through community action. The main driver for their emergence is not profit but

social needs and ideology. Instead of firms, they emerge in a variety of organisational forms – from informal groups to cooperatives. The resource base of GI initiatives[1] does not come from selling their innovations but from voluntary work, grant funding and limited commercial activities. GI initiatives create spaces where alternative rules and values lead to innovative ways of meeting social and environmental needs that empower individuals and communities (Seyfang and Smith, 2007). Some examples of GIs are ecovillages (Roysen and Mertens, 2019), community energy (Hargreaves et al., 2013a), community currencies (Seyfang and Longhurst, 2013) and agroecology (Orozco-Meléndez and Paneque-Gálvez, 2022).

Although studies on GIs have multiplied over the past 20 years, the literature on the topic is very scattered, limited in geographical reach, and still lacks a theoretical framing (Hossain, 2018; Korjonen-Kuusipuro et al., 2017). There are gaps in the understanding of how GI initiatives influence society and diffuse their innovations (Seyfang and Longhurst, 2016). This paper, therefore, addresses the following question: *in what ways do GI initiatives influence broader sustainability transition processes?*

To answer this question, we draw on the concept of *embedding*, i.e. "the overall process by which outputs of experiments may come to

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[1] In this paper, we use the term *grassroots innovations* (GIs) to refer to the novel social practices being developed by civil society groups (the GI initiatives), including new meanings, competencies and materials. We use *GI initiatives* to refer to the local groups generating and diffusing GIs in a specific locality, and *GI niches* to refer to the global dynamics that include both the local initiatives and their translocal networks (Avelino et al., 2020) and intermediary organisations (Hargreaves et al., 2013a).

generate wider influence beyond their initial conception and setting" (Sengers et al., 2021, p. 1155). This concept emphasises a cumulative, complex and multidimensional process of influences in which niche experiments, knowledge and capabilities become partially imprinted in configurations outside the niche. While existing research on GI diffusion tends to use the three-pathway model (Boyer, 2016; Cairns et al., 2023; Ornetzeder and Rohracher, 2013; Seyfang, 2010; Seyfang and Haxeltine, 2012; Seyfang and Longhurst, 2016), this paper rethinks the diffusion of GIs through an embedding approach. We provide a framework to study the influence of GI initiatives on mainstream society, which we then use to study ecovillages in different contexts.

This paper is structured as follows: we first discuss the predominant approach to the study of GI diffusion, and the gaps it currently presents (Section 2). After that (Section 3), we present an overview of the concept of embeddedness, and develop a framework to the study of GIs' embeddedness in society. In Section 4, we apply our framework to a qualitative study of 24 ecovillages in different countries. In Section 5, we discuss our framework, the limitations of this study, and suggest different ways of how this framework can be further developed.

2. Diffusion of grassroots innovations: the predominant approach

The main current approach used in studies on the diffusion of GIs is what we can call the three-pathway approach (Boyer, 2015, 2018; Ornetzeder and Rohracher, 2013; Seyfang, 2010; Seyfang and Haxeltine, 2012; Seyfang and Longhurst, 2016). In this approach, diffusion of GIs occurs through:

(1) **Replication** of individual projects within the niche through e.g. courses and publications sharing know-how with interested individuals (Seyfang, 2010). This is the most common form of diffusion of GIs as they are "designed to be empowering and accessible to civil society groups wanting to experiment, therefore easy to transfer to new locations" (Seyfang and Longhurst, 2016, p. 19);

(2) **Scaling up** to expand innovations to a broader audience beyond committed niche members (Boyer, 2015; Ornetzeder and Rohracher, 2013; Seyfang, 2010). Upscaling can be achieved by broader networking to build bridges with actors from the regime and to reach a wider public, which can be problematic due to the clash of values between niche and regime (Orozco-Meléndez and Paneque-Gálvez, 2022; Seyfang and Haxeltine, 2012). Besides cultural and sociopolitical factors, internal resource constraints can also prevent the scaling up of GIs (Seyfang and Longhurst, 2016);

(3) **Translation** of ideas and practices from niche to regime. Translations tend to occur when there is a crisis in the existing regime, putting it under pressure to change. Often, the translated innovations are adapted to regime settings and most commonly fail to radically transform the regime when there is little second-order learning (Smith, 2007).

Two main problems can be found in this approach: (1) a fuzzy distinction between 'scaling up' and 'translation', and (2) a neglect of the symbolic and cognitive influence of GI initiatives.

The term 'scaling' has originated in studies on economies of scale with a focus on how firms can increase profits and output volume. Since then, it has been applied to different bodies of literature (Aarons et al., 2017; Aggarwal et al., 2018; Reuber et al., 2021; Wilson, 2012) and has also been subject to different forms of critique (Jimenez et al., 2022; Pfotenhauer et al., 2022; Tsing, 2012). Jimenez et al. (2022), for example, criticise innovation approaches that naturalise a logic of growth and universalism. Innovations that seek to operate within ecological boundaries are often non-scalable.

The concept of translation, on the other hand, plays a central role in the sociology of innovation and in actor-network theory (ANT), as developed by Latour (1987) and Callon (Callon, 1986), among others (Akrich et al., 2006). In ANT, the focus of the translation concept is on how networks are formed and how agency, goals, identities and artefacts are mobilised, combined, and transformed (Schögler, 2017; Shiga, 2007).

In empirical studies on GI diffusion, however, the differences between the concepts of "scaling up" and "translation" are not sufficiently clear, being identified in very different ways by different authors (see e. g. Boyer, 2015; Seyfang and Longhurst, 2016; Smith, 2007). For example, Boyer (2015), in his study about the diffusion of ecovillages' innovations, has identified "translation" when the ecovillage housing model was adopted by municipal planners. Seyfang and Longhurst (2016), on the other hand, in their study on Community Currencies, measured "translation" by a set of factors that included involvement of niche actors with lobbying for change and the ability of the national network in establishing new projects. More recently, Cairns et al. (2023) understand translation not as a distinct pathway in itself but as the end-point or final stage of GI diffusion, when there is the potential for regime transformation.

A second gap of the three-pathway model is that it fails to fully grasp the symbolic and cognitive influence of GI initiatives in wider society (in terms of values, ideals, norms and understandings). Much of the work done by grassroots innovators involves the dissemination of (a) new ways of interpreting global problems and potential solutions, and of (b) new meanings about the role of communities in driving transformation. In this symbolic work, GI initiatives and networks are similar to social movement organisations as they produce collective identities, and challenge cultural codes that shape social practices and define societal goals (Melucci, 1996). Moreover, even in instances where there is no replication, scaling up or translation, knowledge generated by and about GIs may influence wider society through its diffusion via media, academic publications and/or interpersonal relationships.

Besides the three-pathway approach based on sustainability transitions literature, different theoretical approaches have also been used to analyse the diffusion of GIs, such as social movement theories (Feola and Butt, 2017), social practice theories (Hargreaves et al., 2013b; Seyfang and Gilbert-Squires, 2019), and Everett Roger's classical theory on the diffusion of innovations (Stüwe, 2009). In the following, we draw on insights from literature concerned with GI diffusion, social innovations and social movements organised around what we call 'dynamics of embedding'.

3. Rethinking the diffusion of GIs

Before we present our framework, it is important to clarify what we understand by innovation in GIs and how we understand diffusion. GI initiatives are mainly focused on *social* innovations. Although they may involve experiments with greener technologies, in GIs "social innovations and the diffusion of technological innovations are intimately linked" (Seyfang and Smith, 2007, p. 588). Social innovations emerge as new social practices that may become institutionalised (Cajaiba-Santana, 2014), including new models of organisation and governance, as well as new ways of framing and knowing (Pel et al., 2020).

When studying the diffusion of GIs, therefore, we must look not only for specific technologies being diffused. GI initiatives are rarely the developers of new technologies, although they usually are early adopters of greener technologies. Consequently, we need a theoretical lens that can specifically identify the diffusion and institutionalisation of their social innovations: the new forms of collaboration, frames, narratives, knowledge and practices they create.

The use of the concept of *embedding* in studies on the diffusion of GIs is adequate as it moves the focus of attention to the cumulative contributions of experiments in the form of shared visions, knowledge accumulation, and network building (Sengers et al., 2021). In this sense, multiple experiments can add up and generate cumulative effects in

society. Embedding, therefore, captures different forms of influence and diffusion that cannot be fully distinguished with the concepts of 'scaling up' or 'translation'.

3.1. The concept of embeddedness

The concept of embeddedness was mainly developed in economic analysis by Polanyi and Granovetter to refer to the embedding of economic behaviour and institutions in society (Granovetter, 1985; Polanyi, 2001; Stanfield, 1980). The concept was then applied to different fields of research (Becker et al., 2017; Murdoch et al., 2000; Ramirez et al., 2020; Schweizer, 1997; Sonnino, 2007; Vestrum, 2014; Wigren-Kristoferson et al., 2022). In these studies, embedding is usually used to analyse the dynamic relationships between specific organisations and the local communities that surround them.

Turnheim et al. (2018a) have applied the concept of embeddedness to innovation studies to better understand the wide variety of ways in which climate governance experiments may have a broader and more lasting influence on society, i.e. informing the establishment of new forms of governance, entering mainstream discourses and challenging established ways of doing. They suggest that embedding can be captured under four macro-processes: scaling up, replication, circulation and institutionalisation (Turnheim et al., 2018b). Sengers et al. (2021) have further developed these processes. They suggest different mechanisms that can occur simultaneously or gradually on different dimensions (in rules, practices, framings or resources), and can be categorised analytically into four ideal types: replication and proliferation; expansion and consolidation; challenging and reframing; circulation and anchoring.

The framework developed by Sengers et al. (2021) offers a good starting point to rethink the diffusion of GIs. However, there are some important differences between climate governance experiments and GIs. While governance experiments are implemented by policy-makers (top-down), GIs are implemented by civil society groups and social movements (bottom-up). While governance experiments tend to have a pre-determined temporal dimension and expected outputs (Turnheim et al., 2018b), GI initiatives may continue over time. Their continuation depends on resources and motivations, and expectations around the GI may change over time. We must, therefore, adapt and expand these theories to better fit the specificities of GIs. We do so by conceptualising how these different embedding mechanisms relate to specific dynamics through which GI initiatives influence the socio-technical configurations of their local environments. We also suggest the importance of looking at how GI initiatives shift material arrangements, and how different dynamics interrelate and reinforce each other.

3.2. A GI embedding framework

In this section, we present the embedding dynamics of our framework. While each dynamic is described separately, they tend to occur in entangled ways and often re-inforce each other. The relationships between these different dynamics is explored in more detail in the discussion in Section 5.

3.2.1. Expansion

The first dynamic through which GIs can become embedded in society is expansion. Expansion occurs through relationships between members of GI initiatives and external actors. Of relevance here are the strategic efforts of GI actors to create projects and collaborations with actors from outside their niche. Due to the clash of values and lifestyles between GI initiatives and their local social environment (Seyfang and Smith, 2007), expansion of GIs requires boundary work. Through this boundary work, GI initiatives are able to create relationships and collaborations with other actors that do not necessarily share the same interests, goals, values or ideologies (Koehrsen, 2017), such as governmental actors, other social movements, funding agencies, businesses and academic institutions. Examples of expansion are: participation of GI

initiatives in local political councils, and strengthening relationships between members of GI initiatives and local communities.

The understanding of expansion as boundary work shows that the opening and closing of the boundaries of a GI initiative is the result of a dialectic dynamic between the GI initiative and its external environment. Expansion is, therefore, dependent on the setting where the GI initiative is located and its cultural, economic and social characteristics (for a comparison of expansion activities between ecovillages located in different contexts, see e.g. Roysen and Schwab, 2021). Although GI initiatives are characterised by their local contextualisation, their expansion can also occur beyond the local level, through activities of intermediary organisations and translocal networks at the national or global levels (Hargreaves et al., 2013a).

Through dynamics of expansion, GI initiatives influence wider transition processes by reconfiguring the social networks (including the involvement of new actors) in a given territory or arena.

3.2.2. Reframing

The second dynamic through which GIs can become embedded in society is via reframing. This dynamic focuses on the cultural impact of GI initiatives in wider society, and it may be an unintentional result of GI initiatives' expansion work, or it can also be a result of strategic efforts of initiatives to challenge dominant ways of interpreting the world's problems and possible solutions. Here, what is embedded are new perspectives or "frames".

The concept of frame is derived primarily from the work of Goffman (1974) and is understood as a framework of interpretation through which individuals can condense complex experience, label them and give meaning to them. Frames define the problems that need change, attribute blame to things or people, and urge people to act in order to transform the situation. Frames are drawn from the mainstream cultural landscape and the dominant narratives of a certain time, but they can also change them (Jasper, 1997; Polletta, 1998, 2008; Strang and Soule, 1998; Whittier, 2007). As Whittier has underlined, "as they [activists] change frames and discourses in mainstream culture, they alter the cultural context with which other social movements engage. In doing so, they can facilitate other movement's emergence or demise, increase or decrease their likelihood of influence, or shape their direction" (Whittier, 2007, p. 546).

Reframing dynamics do not necessarily need to occur through engaged activism. As Tindall and Piggot (2015) have shown, influences can also occur outside the arena of social movements, through personal relationships with co-workers, friends, family members and neighbours in the context of activists' everyday lives. Examples of reframing are: efforts of GI initiatives to raise awareness on climate change, and participation of GI initiatives in protests against polluting industries.

Through reframing, GI initiatives influence broader sustainability transition processes by spreading new narratives and frames that can mobilise potential supporters, legitimise niche activities, demobilise incumbent actors, and promote transformations in the cultural landscape of society.

3.2.3. Circulation of knowledge

The third dynamic is circulation of knowledge, which focuses on knowledge production and dissemination by grassroots innovators that may influence and become embedded in wider society. At the local level, the organisation of courses and workshops are channels through which tacit and generalised knowledge of GI initiatives may spread and influence their local social environment. Moreover, members of GI initiatives may also diffuse knowledge at the regional and global level by visiting other initiatives, participating in gatherings and consulting activities, and elaborating manuals and instructional websites.

Many GI initiatives lack the resources and capacities to systematise the knowledge acquired in their innovation work - some GI initiatives may also not be interested in that - and this knowledge may be lost if the initiative ends (Seyfang and Smith, 2007). Intermediary organisations

and actors are therefore relevant for dedicating work to the generalisation and circulation of knowledge. By aggregating knowledge and establishing a knowledge infrastructure, those actors make knowledge mobile and accessible to mainstream society and policy-makers (Hargreaves et al., 2013a).

Knowledge embedded by a GI niche may also become available for future experiments in different contexts of application. Ecovillages, for example, can be seen as a phenomenon that emerged in the 1990s from the accumulation of knowledge and experiences developed by alternative communities that proliferated in the 1960s, 70s and 80s (Mattos, 2015; dos Santos-Júnior, 2015). In the 2000s, different elements of ecovillages have also become embedded in different contexts of society. For example, the Transition Town Movement was created in 2005 by Rob Hopkins, a former resident of an ecovillage and permaculture teacher (Dias et al., 2017; Liftin, 2014).

Through circulation of knowledge, GI initiatives influence broader sustainability transition processes by developing and diffusing new knowledge on sustainable practices and by widening the range of skills and capabilities available for other actors.

3.2.4. Shifting material arrangements

The fourth dynamic of GI embedding focuses on shifts and re-assemblages in the materiality of contexts outside the niche. Shifts in material arrangements can occur in different ways: (1) through physical structures and objects created (or made available) by members of GI initiatives as a result of their innovative work. These structures and objects can be located or circulate outside the boundaries of a GI initiative (e.g.: shops, alternative currencies, products); or they may be located or circulate within the boundaries of a GI initiative but remain accessible to external actors (e.g.: markets, schools, shops, venues, shared cars and tools, community banks).

This dynamic can also occur through the (2) transformation of the natural environment, such as planting (or cutting) trees, creating community gardens, preservation of flora, fauna and water systems. Another aspect of this dynamic refers to (3) impact in economic resources, such as: job generation; stimulation of local economies through community bank loans (Brito and Oliveira, 2019) and increase in local tourism (Murdoch et al., 2000; Sonnino and Marsden, 2006); diversification of economy through the attraction of young people to rural areas (Roysen and Schwab, 2021); and reduction of energy costs (Seyfang et al., 2013).

Through shifting material arrangements, GI initiatives influence broader sustainability transition processes by widening people's access to sustainable products, preserving natural resources, or fostering economic diversification and resilience in a given territory.

3.2.5. Replication

Finally, the replication dynamic focuses on how GI initiatives recruit new actors into their practices, and how these new actors reproduce these practices in different contexts. When analysing GIs, we suggest that it is important to distinguish between different levels of replication: (1) replication of specific single practices, and (2) of complexes of practices that characterise a specific GI. For example, an ecovillage can inspire external actors to replicate specific practices, such as sharing vehicles (Bochinski, 2015) or composting. But they can also inspire external actors to replicate a set of practices that can characterise them as an ecovillage (including composting, community living, horizontal decision-making, etc.). In the latter case, replication can be carried out either by the creation of a new GI initiative in a new context, or by new actors joining an existing initiative. In this framework, therefore, growth in the number of members of a GI initiative can also be considered replication, as more people are recruited into its practices.

The replication dynamic of GIs as a complex of practices is also described in current approaches to GI diffusion. Intermediary organisations (Hargreaves et al., 2013a) and translocal networks (Avelino et al., 2020) may support replication by inspiring the emergence of new projects in different contexts. However, the process of embedding

practices may require that intermediary organisations and local actors negotiate the meanings and expectations of the concerned GI so that it can become more context-specific and appropriated by the groups on the ground (e.g.: Bakola, 2019).

Through the replication dynamic, GI initiatives influence broader transition processes by reconfiguring social practices that can become institutionalised (Fuenfschilling and Truffer, 2014), and by fostering the proliferation of niche initiatives that can, in turn, embed sustainable innovations in new territories or in new dimensions of social activity.

4. Applying the framework to an empirical study

Ecovillages are a type of GI initiative that focuses on creating sustainable settlements. They do so through a holistic approach that integrates practices in different dimensions of daily life: the social dimension (e.g. collective organisation of daily tasks), the cultural dimension (e.g. spiritual practices), ecological dimension (e.g. sustainable building), and the economic dimension (e.g. sharing resources) (Boyer, 2016; Pisters et al., 2020; Roysen and Schwab, 2021).

In the past 15 years there has been an increase in the number of studies exploring ecovillages, mainly focusing on motivations, identities and forms of social organisation (Kasper, 2008; Westskog et al., 2018); values and worldviews (Morris, 2022; Pisters et al., 2020); innovations (Boyer, 2016; Mychajluk, 2017; Roysen and Mertens, 2019); educational activities (Roysen and Cruz, 2020; Skanavis and Manolas, 2015); internal social relations (Mafle et al., 2021); environmental impact (Belleze et al., 2017; Daly, 2017; Sherry, 2019; Wiest et al., 2022); and transnational networks (Kunze and Avelino, 2015).

In this paper, we focus on the different ways through which they embed their innovations in their local social environments. In the following, we describe the methods used for the selection of case studies, data collection and analysis, followed by the main results.

4.1. Methods

We analysed 24 semi-structured interviews with representatives from ecovillages in different countries. The interviews were conducted in the context of the research project Ecovillages as Incubators for Sustainability Transitions (EVIST). The selection of countries included was based on two criteria: (1) countries that have a minimum number of six projects registered in the Global Ecovillage Network international database.[2] (2) From this list, we followed a most distinctive case selection and selected the 11 countries with the highest GDP/Capita[3] (total of 277 ecovillages) and the 16 countries with the lowest GDP/Capita (total of 216 ecovillages).

The selection of ecovillages within the designated countries was also based on a most distinctive case selection in order to include different types of ecovillages, in different countries, with various characteristics, sizes and years of existence. We then conducted 24 qualitative semi-structured video interviews (via Zoom). Table 1 shows the number of interviews per country. The interviews were conducted between April and May 2022 in English, French, Portuguese, Spanish, German and Dutch. They were on average 1 h and 40 min long and focused on the *local* diffusion of innovations from ecovillages to their local social environment. All interviews were transcribed and translated into English and then analysed with the qualitative data analysis software MAXQDA (VERBI Software, 2021). The names of the ecovillages and interviewees were omitted to protect their identities.

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[2] Data on the number of ecovillages per country was retrieved on 28.02.2022 from the GEN database accessible at: https://ecovillage.org/projects/.

[3] We used 2020 data of GDP per capita adjusted to purchasing power parity (PPP) rates. Data was retrieved on 23.02.22 from the World Bank website: https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD.

Table 1
Countries included in this study, number of ecovillages existent in each country, countries' GDP per capita and number of interviews per country.

Countries low GDP/capita	No. of ecovillages	2020 GDP/capita PPP	No. of interviews
DR Congo	12	1082	1
Senegal	7	3321	1
Nepal	13	3800	1
Ghana	13	5446	2
India	33	6166	1
Philippines	7	7954	1
Peru	7	11,261	1
Indonesia	11	11,445	1
South Africa	11	12,666	1
Colombia	24	13,449	2
Brazil	37	14,064	2
Total low GDP/capita	**216**		**14**

Countries high GDP per capita	No. of ecovillages	2020 GDP/capita PPP	No. of interviews
Canada	34	46,103	1
Australia	27	48,690	1
Sweden	10	50,923	1
Germany	33	51,374	1
Netherlands	7	54,326	1
Denmark	7	55,820	1
US	103	60,287	2
Norway	6	63,548	1
Switzerland	8	68,753	1
Total high GDP/capita	**277**		**10**

Total ecovillages interviewed			**24**

4.2. The embedding of ecovillages' innovations

The global ecovillage niche includes a great diversity of initiatives, especially in the Global South. Some of them are intentional communities, where groups of people from different family backgrounds decide to live together. Another type of initiative found in Africa and Asia are ecovillage training centres. These are NGOs employing ecovillage strategies to render existing communities more sustainable. There are also different types of other initiatives based on ecovillage principles and practices that are listed on the GEN database, such as an indigenous community, an eco-resort and a municipality in transition. The different types of ecovillages included in this study, their main characteristics and embedding dynamics can be found in Appendix A. The frequency of the different embedding dynamics in our sample and some exemplary quotes can be found in Table 2. In this section, we illustrate the different dynamics with selected cases from our study.

4.2.1. Expansion

Most ecovillages are not fully self-sufficient and their members work, buy and use facilities from the local municipality, such as shops and schools. They participate in different local organisations and networks, as professionals or volunteers, such as fire departments, networks of community-supported agriculture and political committees. They also receive people from the region in their communities to participate in events (such as potlucks, parties, courses, market days, guided visits etc.), to work (cooks, plumbers, electricians, builders etc.) or use services (midwives, veterinarians, therapists etc.) and facilities (such as a corn mill or a café). In ecovillages created by people born in the own region, family and friendship ties with people from outside the ecovillage are maintained. These characteristics allow them to interact and create networks with different local actors.

All ecovillages in our sample establish relationships and/or collaborations with external actors in their regions. Many ecovillages become skilled at building bridges between divergent social worlds, expanding local networks engaged in sustainability transitions even when the actors involved do not necessarily share the same interests, goals, values or ideologies. A rural ecovillage in Brazil (E05), for example, started organising meetings with the residents from their neighbourhood in order to identify local needs. From these meetings, many projects emerged. The main project was the participatory management of waste with the installation of collection bins for recyclables and awareness-raising initiatives. In order to carry out this project, the ecovillage built bridges not only with local farmers, workers, business owners, and a waste collectors cooperative, but also with local schools and with municipal authorities. Through this boundary work, the ecovillage has become an important actor in the region's social and political networks.

The participatory model developed for waste management by the ecovillage was so successful that the municipality wants to expand it to other neighbourhoods, indicating that it is becoming embedded in the region and, therefore, influencing a broader transition process in the waste management regime. This influence of the ecovillage on regime reconfiguration was possible due to two main factors: (1) the ecovillage's expansion efforts through collaborations with neighbours and municipal governmental agencies; and (2) the existence of sustainable waste managing policies at the country level that created a favourable landscape for these boundary projects to be created.

However, dealing with actors from different social worlds and institutional settings presents many challenges. One of them relates to difficulties in the relationship with governmental actors. According to the interviewees (E05), while many people inside governmental agencies are well-intentioned, especially the ones with more technical expertise, the more political figures are often not so interested in sustainability transitions and may even have competing interests to maintain the *status quo*. Similar claims also emerged in interviews with other Latin American and Asian ecovillages.

Examples of expansion are abundant in other ecovillages as well. An ecovillage in India (E22) is collaborating with different local partners, including governmental bodies in the areas of health care, education, skills development and livelihood, and research. An urban ecovillage in Brazil (E09) is connected to different artistic-cultural networks of their municipality. During the pandemic, they also collaborated with other leaders of organisations in the periphery of the city to support families during the crisis. An ecovillage in the Netherlands (E04) has developed a new zoning plan for the municipality specifically designed for ecovillages.

Through dynamics of expansion, ecovillages are able to communicate their innovations to a much wider audience. But it also presents many challenges, and GI initiatives have to learn how to deal with actors from different social worlds that follow other institutional logics.

4.2.2. Reframing

In our study, it was possible to identify examples of ecovillages that disseminate new ways of framing current problems. An indigenous ecovillage in Colombia (E08), for example, has reported an effort to challenge local views on development. The municipal government tried to evict them from their land in order to build a jail and had justified this decision as an opportunity for local development by creating jobs, increasing the value of the properties and helping the local economy. The indigenous community was then framed as an "obstacle for development". The members of the ecovillage then reframed their community as a symbol of solidarity and *buen vivir* in order to convince their neighbours to decide against the construction of the jail. They argued with the neighbours that the increased value of the land would also generate an increase in taxes and the displacement of peasant families. These reframing efforts led the neighbours to support the ecovillage and decide against the construction of the jail.

Many ecovillages described how they use their personal relationships

Table 2
Ecovillages' dynamics of embedding, their frequency in the study's sample and exemplary quotes.

Dynamics of GI embedding	Frequency	Exemplary quotes
Expansion	24 of 24 ecovillages	*"with the Clean Forest [project] of waste management, we were acquiring the trust of the city hall and the perception that we can be important and strategic partners […]. So, on the one hand, the government sees us as partners and realizes that we can work very well in this partnership. On the other hand, there is a very subtle relationship because we also act in fronts that can damage the interests of people who are in the administration. Talking about government as State, as City Hall, in the broadest context, this relationship is beautiful. If we talk about people who hold positions and therefore make important decisions inside the City Hall, with some of them we have complex situations […] because we are seen as people who want to supervise and prevent some processes that they consider to be normal and have to do with the disorderly occupation of land"* (E05, Brazil). *"… we have an old tradition of mingueros, you know? Mingueros, people that make mingas together? […] we have a day, it's Friday for all the participants to get together and go to a place of one of them to work. Most of the work is like planting seeds, growing plants, or doing harvest of whatever, but sometimes is to build something or whatever. […] It's at least 15 people from outside, from different farms. At the beginning it was only the vereda, it means the mountain we are in, but then people from other veredas of the municipality, they started getting together […] and we work in the morning and then at noon we eat, and if we are happy then we drink some beers, or dance, drums, or whatever"* (E15, Colombia).
Reframing	22 of 24 ecovillages	*"On the social side I think that the people living on the [ecovillage] campus relate in a special way that people use them as a reference, like they are good role models for other people living around the community, especially the respect for gender. When I say gender I mean the way we treat women in the community and the way we push to promote, to create space for women all the time… For example, if there is a forum going on and the men have spoken, you have to allow for the women to speak. This is a good example, sometimes they say 'Let's hear from the women first'. So these kinds of relationships are expanding, people are appreciating this knowledge and awareness and consciousness is expanding"* (E18, Ghana). *"In view of this reality, what we have done is a good argumentation in the sense that maybe they [the government] have been wrong, that our struggle is a community struggle, that our struggle departs from solidarity and from the understanding of this good living. Also to think that not everything they [the government] tell us is good […]. So I think that this, and other arguments have made people finally understand, and at the last moment they decided that they definitely did not want the jail [and the displacement of the community]. They supported us, and well, today we are growing in friendship, in trust"* (E08, Colombia).
Circulation of knowledge	22 of 24 ecovillages	*"[The farmer's handbook] shows all the different techniques. […] there are 45 something different [permaculture] techniques and approaches in that and we use all of them. […] So the farmer's handbook is a very key resource. Because we use that for literacy education. […] We use it for farmers training, we use it for barefoot consultants. […] We've even started making videos of some of the techniques as well. […] So the permaculture principle is multiple elements for important functions. So if the function is to demonstrate, educate, replicate, then you have different ways of doing that. So you have physical demonstrations and training courses, but then you also have the book, the farmer's handbook, and then if you also have videos, then it just adds a different way of getting the information out there"* (E02, Nepal). *"We started delivering our own children as part of how we wanted to take care of ourselves. Then local people who wanted homebirth started coming here. Occasionally the midwives would go outside of the community to deliver. That has over the last 50 years turned into a national organisation which has their headquarters here in the community […]. The midwives that we have here are what they call Direct Entry Midwives, or certified professional midwives, which means they are not licensed by the American Medical Association, like a doctor or a nurse. They are their own licensing organisation. That required passing state laws to recognise their own licensing organisation. […] We now have a college degree programme here in the community, a midwifery college that teaches those traditional skills. And you can get a college degree, and it gives you the skills needed to pass that licensing exam to become a certified professional midwife"* (E11, USA).
Shifting material arrangements	23 of 24 ecovillages	Objects and environmental impact: *"That gave me the chance to go to the community […] to bring clean cooking stoves for the women who were into fish smoking, and interventions to protect the mangroves. Because one of the biggest challenges affecting the communities was overharvesting of the mangroves as fuel woods. We decided to provide them with alternative tree seedlings as alternatives for planting, and at the same time the improved cook stoves"* (E10, Ghana). Environmental and economic impact: *"Now they started working on avenues like multicropping systems […] and a lot of sustainable models for integrated farming. […] So diversifying this led to an increase in the annual wages, led to a decrease in the migration, led to more sustenance on the ground. […] So the [ecovillage] rural development [programme] helps the farmers with the preparation of the land, preparation of a seed bank, and these are all indigenous seeds […]. So 50,000 people is the direct impact from this intervention which has been going on since 2009 now. And now the focus areas have been on how can we create value-added products for them […]. So value-added products could be as simple as making cookies, making laddus from the millets that are grown in their field, using a kitchen garden to create some kind of salads, and then selling it out"* (E22, India).
Replication	20 of 24 ecovillages	Replication of specific practices: *"I remember that when we learned to work with the biogas system in [the European ecovillage], and a group from there came to São Paulo, we went to install the biogas system here and they left, it didn't work. Then I remember that we had to tinker. One of our members had to open valves, close valves, do I don't know what, get cow shit, put it inside, we had to tinker with everything. And then suddenly the system was a success, it worked. So it was the hands of [the European ecovillage] with the hands of [our ecovillage]. I think there is something of adaptation, of climate change, of shape change"* (E09, Brazil). Replication of the ecovillage as a complex of practices: *"… because of our mission and vision, we needed not only to inspire but help people to build new ecovillages. So we opened this call […] to do [another] ecovillage […] 30 min from ours. And yes, they did it, because we helped them a lot […]. And we made it, we teach (sic) them sociocracy, we teach them non-violent communication, we tell them how to build the association, […] and they did, and it is an amazing place, and they have now everything, it's brilliant!"* (E15, Colombia).

to bring social and ecological issues to the public debate in their regions. An example was given by an ecovillage in Ghana (E18). The interviewee described how ecovillage members have become an example in the region for ecologically sustainable practices and for gender issues. Through their nationwide radio programmes, their participation in political committees and their educational activities, they bring these issues to the public discourse. Other examples of these dynamics found in our sample were: participation in demonstrations, protests and local social movements; reframing efforts through daily interactions with people from ecovillages' local social environment, such as trying to make people more aware of the problems of climate change; publishing articles in local media outlets; and distributing institutional newsletters.

While it is difficult to measure the impact of a specific organisation in embedding new perspectives, it is reasonable to say that they challenge dominant narratives and contribute to the embedding of alternative ways of seeing things in their locality. It was also mentioned by a religious ecovillage in the US (E17) and by a Swedish ecovillage (E20) that the presence of other alternative projects in the same region contributes to a collective and cumulative influence in the local culture that cannot be traced directly to any of the initiatives in isolation. Therefore, the presence of other local organisations in their regions that resonate with their frames and adopt similar narratives, even without direct collaboration between them, might lead to a cumulative cultural effect and a greater influence in the local cultural landscape. On the other hand, ecovillages that do not count on such cumulative influence in their region may face more challenges to local reframing efforts.

4.2.3. Circulation of knowledge

Most ecovillages hold visitation and educational programmes, including courses, retreats, and volunteering programmes. Through these activities, ecovillages diffuse knowledge to external actors. Some ecovillages in the Global South, such as a rural ecovillage in Brazil (E05) and an agricultural college in Ghana (E18), reported promoting courses in agroforestry and other sustainable practices and offering scholarships for people from their region to participate.

One of the studied ecovillages in Nepal (E02) is a grassroots NGO run by farmers that work with over 30 traditional communities. Their activities are based on the demonstration of sustainable techniques, such as agroforestry, composting or beekeeping. Interested farmers from the region can then receive training and the necessary resources (such as seeds or seedlings, books or videos) in order to replicate these practices at home. To widen their reach and spread sustainable agricultural techniques in the mountainous region, they also work with "barefoot consultants", farmers that are trained to become trainers themselves. To a big part independent from the ecovillage, barefoot consultants work as trainers or orchard developers in villages and regions that are outside the ecovillage's area of influence. The ecovillage has also developed the "Farmer's handbook", including over 45 appropriate technologies and approaches to increase farm productivity while reducing its costs. The handbook is available in Nepali and English for download on their website. One of the challenges faced by the ecovillage in aggregating knowledge through a handbook was farmers' frequent illiteracy. They seek to overcome this challenge by working with adult literacy education, and by making videos of some of the techniques, besides the physical demonstrations during training courses.

As ecovillages usually have a strong focus on education, circulation of knowledge is a relevant dynamic through which they are able to embed new skills and competencies in their regions.

4.2.4. Shifting material arrangements

Most ecovillages create new physical structures that are available for people from outside the ecovillage. Some of these structures are: collection bins for recyclables, alternative schools, new stores, markets and co-ops with organic and local products. They may also help local communities to improve their infrastructure through support for the construction of sustainable water or energy systems, establishment of

health centres or the diffusion of sustainable technologies, such as clean cooking stoves and solar lighting systems. Sometimes, the ecovillage itself becomes an important physical setting for the locals. The agricultural college in Ghana (E18), for example, is a space always open for the local community. Local children go to play there because there are green grass and many trees. They also have a cornmill, and locals bring their corn to the ecovillage for milling.

Regarding the transformation of the natural environment, many ecovillages create protected areas or projects around reforestation and preservation of indigenous seed. Besides generating jobs for locals, many ecovillages also have a relevant economic impact in their region through the offering of trainings that lead to a diversification of local economies and increased wealth generation. In the Global South, direct support through food distribution or the establishment of bartering systems also has an impact on local economies, which proved to be especially relevant during the Covid-19 pandemic.

To illustrate this dynamic, we highlight the work of an ecovillage in India (E22). Representatives of the ecovillages estimate that around 4000 meals are prepared in their kitchen every day, 90 % of these meals are distributed in their temple free of charge. Through their collaborations with district administrations and other partners, they claim to have set up three healthcare centres that work with tele-medicine free of charge, including pharmacies and diagnostic labs. According to the interviewee, the ecovillage was also able to build a skills-development centre in the beginning of 2022 to train 2000 students a year. After their training, students get placed within one of the 25 companies the programme works with. Their livelihood programme focuses on new agricultural models combining short, middle and long-term crops, goshalas and cattle farms, and preservation and use of indigenous seeds. They estimate that the diversification of economies through the livelihood and skills-development programmes have increased the annual wages of 8500 households in 100 % and led to a decrease in outward migration. During the Covid-19 pandemic, their activities ensured that the local communities had a greater resiliency compared to other regions.

In the case of the ecovillage training centres in Africa, the interrelations between materials, economy and ecology are even more evident. According to an ecovillage training centre in Ghana (E10), for example, the new cooking stove technology they have introduced in the community they work with has diminished the users' harvesting of mangroves to be used as fuel, having an impact on mangrove preservation. An ecovillage training centre in DR Congo (E06) also implemented projects to enhance local communities' productivity through a strategy of adaptation to climate change, i.e. community agroforestry, permaculture, and valorisation of parcel spaces, having important ecologic and economic impacts. Additionally, their interventions are carried out in community land in order to generate shared wealth.

4.2.5. Replication

Many of the specific practices being embedded by ecovillages were not necessarily created by them (e.g.: biogas, agroforestry, renewable energy etc.). However, ecovillages usually act as 'hubs' of early adoption, experimentation and diffusion. Interviewees have reported some examples of replication of specific practices by workers, friends, partners, students and visitors of the ecovillages, such as vegetarianism, recycling, use of solar panels, permaculture, tree planting, etc. A cohousing project in Canada (E19) reported that more developers in their region are trying to include common facilities in their projects. An ecovillage in the US (E17) reported having visitors who end up in other communities and replicate some of the practices learned at their ecovillage, such as their consensus methodology for decision-making. The alternative educational kindergarten created by an ecovillage in Germany (E21) has been replicated by parents from the region who started their own alternative primary school.

When analysing the replication of ecovillages as a complex of practices, we could see that the fluid concept of ecovillage, lacking any strict

criteria or centralisation, allows for its adaptation to many different social, economic and cultural settings – from an indigenous community in Colombia to a high-income residential development in Australia. The interviews showed that translocal ties between different ecovillages and with transnational intermediaries, such as GEN and its regional networks, also play a role in replication. For example, an urban ecovillage in Brazil (E09) was created after a local activist was invited to visit an ecovillage in Europe, and decided to replicate some technologies and practices in his own project.

After a new ecovillage initiative is established, they very often become intermediary actors themselves, distributing knowledge and providing training and support that leads to the replication of ecovillages or of specific practices in their local contexts. These results show that replications in the ecovillage niche are decentralised and "reactive" (Seyfang and Longhurst, 2016), that is, they occur without the need of approval from the global or regional networks but may receive support from them. Replication of ecovillages seems to follow a bottom-up pattern, where local citizens actively search for intermediaries (a role that can be performed also by ecovillage initiatives) to help them establish new ecovillages or to transition existing villages into ecovillages.

5. Discussion and conclusion

In this paper, we contribute to sustainability transitions literature by proposing a new framework to study the influence of GI initiatives in wider society and their role in transitions. To this end, we draw on different theoretical approaches and previous studies on GI diffusion and organise the insights and lessons learned in five dynamics of embedding. Through expansion, reframing, circulation of knowledge, shifting material arrangements and replication, GI initiatives influence broader sustainability transition processes through a reconfiguration of the social networks and the promotion of novel cultural frames, competencies, material arrangements and social practices in a given territory.

In this section, we first discuss the relationships between the different embedding dynamics presented in this paper (Section 5.1). We then point out the advantages of this framework when compared to the predominant three-pathway approach to GI diffusion (Section 5.2). Finally, we present the limitations of this paper and discuss how this framework could be further developed (Section 5.3).

5.1. Relationships between the dynamics of GI embedding

The different dynamics of GI embedding described in this paper tend to occur in entangled ways and to re-inforce each other. The relationships between them are illustrated in Fig. 1 and explained below.

The first embedding dynamic represented in the figure is expansion. The embedding of a certain GI initiative can be limited to dynamics of expansion, i.e. they may establish relationships with actors from outside the niche and reconfigure local social networks, without having much influence on them. However, in our empirical data, expansion was often a first step towards other dynamics of embedding. It is through relationships and collaborations that reframing, circulation of knowledge and shifting material arrangements can occur.

Previous studies have demonstrated the importance of expansion for other types of GI initiatives as well. The Social Technology Network in Brazil, for example, involved grassroots communities, universities, private firms and state organisations (Fressoli et al., 2014). In their study with initiatives from the Transition Movement worldwide, Feola and Nunes (2014) showed that 66.4 % of the active transition initiatives surveyed are currently cooperating with local authorities. Expansion is, therefore, an important dynamic of GI embedding, and future research could explore its challenges and potentialities in more detail, including the power relations present in these collaborations.

Reframing, circulation of knowledge and shifting material

arrangements are only possible through relationships between a GI initiative and actors from outside their niche (expansion). These relationships may be direct or mediated. Examples of direct relationships are the indigenous ecovillage's reframing efforts with their neighbours; the courses organised by a Danish ecovillage; or the donation of food by the urban ecovillage in Brazil. Examples of mediated relationships are the Ghanaian ecovillage's reframing efforts through a radio programme; or the downloadable handbook organised by the ecovillage training centre in Nepal.

While reframing, circulation of knowledge and shifting material arrangements can be analysed as dynamics on their own, they are often intertwined with each other. For example, the ecovillage training centre in Ghana tries to create awareness in local communities on the importance of protecting mangroves and mitigating climate change (reframing) *while* carrying out training activities (circulation of knowledge) *and* disseminating clean cooking stoves (shifting material arrangements).

Replication of GI practices occurred less frequently than the other dynamics in our sample. According to social practice theories, practices are composed of different elements such as symbolic meanings (frames), competencies (knowledge) and materials (things and technologies). Therefore, replication dynamics are only possible when actors outside the GI initiatives encounter GI actors (expansion), align with their frames (reframing), and when they acquire the necessary skills (circulation of knowledge) and materials (shifting material arrangements) to engage in these practices. However, while a pre-requisite for the replication of practices, the mere existence of frames, knowledge and materials is not enough. They also need to be actively connected by agents through situated instances of performance (Shove et al., 2012). For example, people wanting to join an ecovillage or create a new ecovillage might already align with ecovillages' narratives and frames, have attended courses to gain more knowledge on ecovillages' practices and lifestyle, and have the necessary resources to become a member, but decide not to do so. Some reported challenges in recruiting new actors to ecovillages' practices are: newcomers' difficulties in feeling accepted by the group, in achieving the required changes in behaviour, and feelings of frustration due to utopian expectations of life in an ecovillage.

5.2. Advantages of the GI embedding framework

The GI embedding framework presented in this paper offers a more nuanced view of the different dynamics through which GI initiatives influence wider society than the current three-pathway approach. When trying to find correspondences between the two approaches, we argue that, in the embedding framework, all the different dynamics involve 'scaling up', as they open GI networks, frames, knowledge, materials, and practices to a broader public beyond the niche. In the same way, all different dynamics of embedding, when involving more powerful regime actors, may resemble the 'translation' diffusion pathway.

An important advantage of the embedding framework proposed in this paper is that it addresses the symbolic work carried out by GI initiatives. This symbolic influence is absent in the three-pathway approach to diffusion, but it is a fundamental dynamic in their innovative work. The importance of meanings and narratives in social innovations was already brought up by the Transformative Social Innovation theory (Pel et al., 2020; Wittmayer et al., 2019). According to their studies, 'narratives of change' can motivate individuals to stabilise certain practices, and "function as practical guidelines providing general principles and concrete examples for the kind of activities and practices that help creating, shaping and thus prefiguring a desired, alternative future in the current world" (Wittmayer et al., 2019, p. 9). Information and communication technologies enable the dissemination and sharing of narratives across networked individuals and initiatives at a global scale. In this way, narratives help to create a sense of identity and belonging, and can recruit new supporters (Wittmayer et al., 2019).

When countering existing frames, GI initiatives acquire some of the characteristics of social movements, by challenging the *status quo*
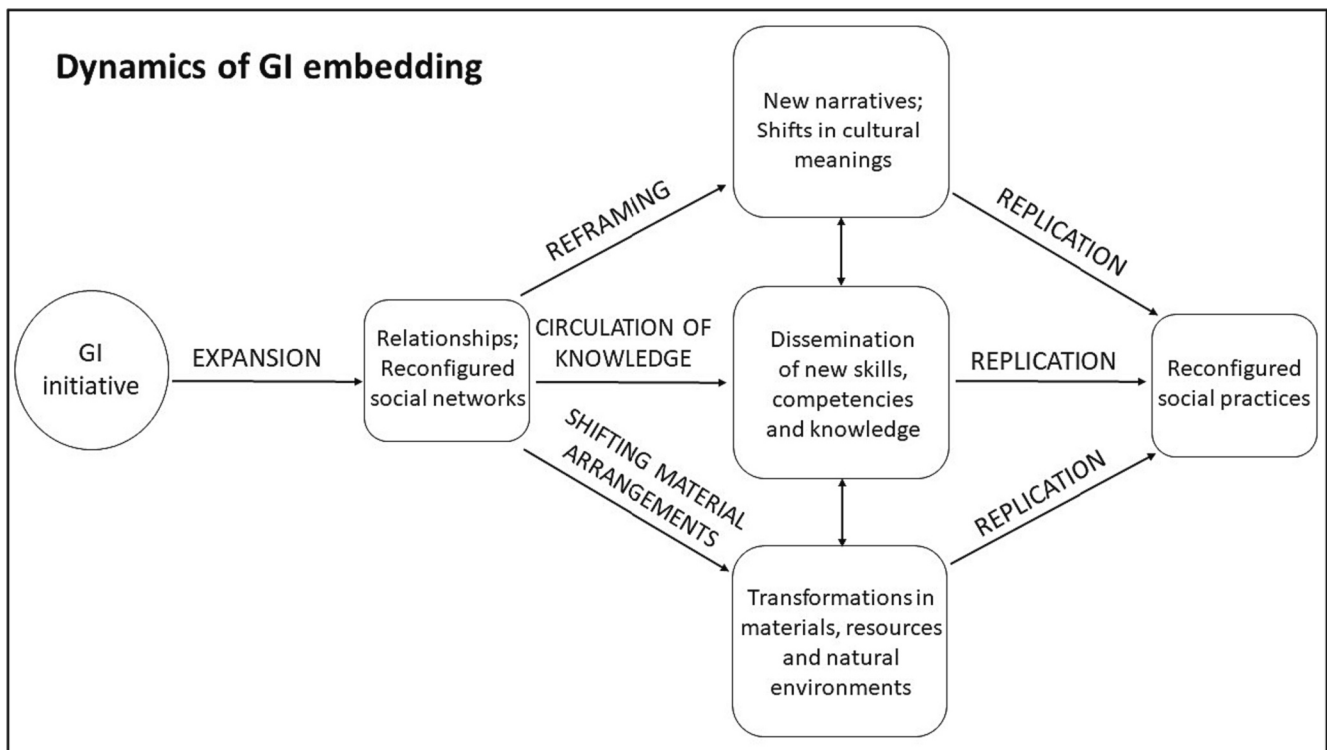
Fig. 1. Dynamics of GI embedding: expansion, reframing, circulation of knowledge, shifting material arrangements, and replication.

beyond their borders. For example, in the case of the indigenous eco-village in Colombia, although they are not stimulating circulation of knowledge or replication, they have still influenced their region through their reframing efforts. Studies on reframing dynamics of GI initiatives may benefit from a broader dialogue with social movement scholarship, such as studies on the impact of social movements' framing efforts in other movements (Whittier, 2007), in the recruitment of new members (De Vydt and Ketelaars, 2021; Snow et al., 1986), and in influencing cultural change in broader society (Amenta and Polletta, 2019; Earl, 2007). Research that investigates the dialectic relationship between GI actors' frames and the mainstream cultural landscape may also identify the strategies used by GI actors to speak to a wider audience and to embed their messages (e.g. Boyer, 2018).

Another advantage of the embedding framework is that it addresses the influence of GI initiatives on the knowledge circulating in wider society. Through courses and volunteering programmes, GI initiatives are able to diffuse their knowledge to a broader public. In the case of ecovillages, even when there is translocal diffusion of skills, as was reported by some initiatives, they tend to happen via direct relationship, i. e. through in-person participation in courses and trainings. Therefore, in contrast to Sengers et al.'s (2021) model for governance experiences, in GIs, direct personal relationships are highly relevant to circulation.

Finally, a third advantage of this framework is that it also addresses the material impact of GI initiatives in their regions, including their ecological and economic impact, and the interrelations between them. GI initiatives not only diffuse frames and knowledge but may also transform the material landscape of their territories. Shifts in material arrangements may facilitate the reproduction of sustainable practices, for example, by opening a local market for organic food products. However, these shifts can also have an impact on its own. For example, when an ecovillage creates a protected area or distributes food for underprivileged people, they are not necessarily leading to a replication of ecovillage practices, but they are having a direct impact on local resilience, food security, and health.

5.3. Limitations of this study and research outlook

There are three main limitations to our study. Firstly, we have only conducted interviews with the ecovillages themselves and not with the external actors, and we have not conducted observations in loco in order to triangulate our results. Therefore, there may be a bias in the data towards positive impact. It is important to clarify that GI initiatives may also have negative impacts, such as raising land prices and costs of living in their regions, exploration of local labour, and marginalisation of local groups (Namakkal, 2012; Venkitaraman and Joshi, 2022). Future research on the impact of GIs should go beyond interviews with GI initiatives' members to include observations and interviews with stakeholders that are not part of the GI niche. Such research design may allow researchers to better capture possible negative impacts of GI initiatives, as well as the power relations involved in these dynamics of embedding.

Another limitation of this study is that we only observed one direction of the dynamics of embedding: from the ecovillages to their local social environment. However, embedding processes are the result of reciprocal alignments. Future research could, therefore, shed more light on how external networks, frames, knowledge, materials and practices influence the development of GIs. For example, GI initiatives' expansion efforts, and the boundary work it entails, may feed-back and produce transformations in the initiatives themselves. It would be important to better understand how local cultures influence GI initiatives located in different contexts; how knowledge and competencies from local actors are learned by GI members; and how the material arrangements of GI contexts (including economic and natural resources) constrain or enable the development of innovative practices.

Thirdly, our empirical study has focused on local relationships and collaborations. Future studies could apply this framework to GI intermediaries and translocal networks in order to see how these dynamics operate at the national and international levels. Another important issue that needs to be further investigated is the "dark side" of embedding, as over-embeddedness may result in path dependency (Wigren-Kristoferson et al., 2022). Future studies could illuminate in what ways GI

initiatives need to dis-embed in order to access external resources and be able to continue stimulating innovations.

We suggest that this framework could be further developed by conceptualising distinctions between vertical and horizontal dynamics of embedding, as suggested by studies on the embedding of agri-food networks (Higgins et al., 2008; Murdoch et al., 2000; Schweizer, 1997; Sonnino, 2007; Sonnino and Marsden, 2006). In this conceptualisation, horizontal GI embedding could relate to dynamics occurring at the local level, or within the same arena of civil society, and vertical embedding could relate to dynamics involving regime actors such as policy-makers.

Previous research has suggested the role of academic researchers and institutions in legitimising and giving scientific support to GIs, which in turn facilitates their inclusion in public policies (Caporal and Petersen, 2011). Knowledge generated and circulated *about* GIs by higher learning/research institutions and policy-makers may have a stronger legitimacy in society and a wider influence on societal transformation. Future studies could investigate the influence of academic, journalistic or political discourses in (de)legitimatising and (dis)embedding GIs in society.

To further investigate the potentials and limitations of this framework and its application to different GIs, more empirical research is necessary. Due to the enormous variety in approaches, goals and motivations of GIs, we expect the broadness of the framework to be useful to grasp embedding dynamics in various transition processes but see the potential necessity to adapt it to the characteristics of specific GIs. The relationships between these dynamics and the social, economic, cultural and technological characteristics of the studied contexts may provide further insights into the potentials and limitations of different GI initiatives to influence mainstream society.

CRediT authorship contribution statement

Rebeca Roysen: Conceptualisation; methodology; investigation; writing of original draft; review & editing; project coordination.

Nadine Bruehwiler: Conceptualisation; methodology; investigation; writing of original draft, review & editing.

Lasse Kos: Conceptualisation; methodology; investigation; writing of original draft, review & editing.

Robert Boyer: Review & editing.

Jens Koehrsen: Methodology; review & editing; supervision; funding acquisition.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix A

Table 3

Ecovillages included in this study, their main characteristics and dynamics of embedding (Expansion – EP; Reframing – RF; Circulation of knowledge – CK; Shifting material arrangements – SM; and Replication – RP).

Ecovillage code	Country	Type of ecovillage	Year of foundation	Number of permanent residents	Embedding dynamics
E01	Australia	Residential development	2005	330	EP; CK; SM; RP
E02	Nepal	NGO (Ecovillage training centre)	2011	Does not apply	EP; RF; CK; SM; RP
E03	Switzerland	Rural intentional community	2009	80	EP; RF; CK; SM; RP
E04	Netherlands	Rural intentional community	2019	15	EP; RF; CK; SM; RP
E05	Brazil	Rural intentional community	2015	10	EP; RF; CK; SM; RP
E06	DR Congo	NGO (Ecovillage training centre)	2000 (working with ecovillage approach since 2012)	Does not apply	EP; RF; CK; SM; RP
E07	Indonesia	Eco-resort	2018	1	EP; RF; CK; SM
E08	Colombia	Indigenous rural community	2002 (relocated in 2017)	166	EP; RF; SM
E09	Brazil	Urban intentional community	2010	31	EP; RF; CK; SM; RP
E10	Ghana	NGO (Ecovillage training centre)	2014	Does not apply	EP; RF; CK; SM; RP
E11	USA	Rural intentional community	1971	220	EP; RF; CK; SM; RP
E12	Peru	Religious intentional rural community	1989	20	EP; RF; CK; SM; RP
E13	Senegal	Municipality in transition	Transition process between 2009 and 2014	7000	EP; RF; CK; SM; RP
E14	Philippines	Rural intentional community	2011	Fluid. 5 at the moment.	EP; RF; CK; SM
E15	Colombia	Rural intentional community	2006	25	EP; RF; CK; SM; RP
E16	Denmark	Rural intentional community	1989	195	EP; RF; CK; SM; RP
E17	USA	Religious rural intentional community	2000	24	EP; RF; CK; SM; RP

Table 3 (*continued*)

Ecovillage code	Country	Type of ecovillage	Year of foundation	Number of permanent residents	Embedding dynamics
E18	Ghana	Agricultural College	1984 (Working with ecovillage approach since 2014)	20	EP; RF; CK; SM; RP
E19	Canada	Urban co-housing	1996	100	EP; RF; CK; RP
E20	Sweden	Rural intentional community	2015	13	EP; RF; CK; SM
E21	Germany	Rural intentional community	2005	60	EP; RF; CK; SM; RP
E22	India	Religious intentional rural community	2009	320+	EP; RF; CK; SM; RP
E23	South Africa	Rural intentional community	Early 1990ies (Working with ecovillage approach since 2020)	55–60	EP; SM; RP
E34	Norway	Camphill Community	1981	28	EP; RF; CK; SM; RP

References

Aarons, G.A., Sklar, M., Mustanski, B., Benbow, N., Hendricks Brown, C., 2017. "Scaling-out" evidence-based interventions to new populations or new health care delivery systems. Implement. Sci. 12, 1–13. https://doi.org/10.1186/s13012-017-0640-6.

Aggarwal, P.K., Jarvis, A., Campbell, B.M., Zougmoré, R.B., Khatri-Chhetri, A., Vermeulen, S.J., 2018. The climate-smart village approach: framework of an integrative strategy for scaling up adaptation options in agriculture. Ecol. Soc. 23, 14. https://doi.org/10.5751/ES-09844-230114.

Akrich, M., Callon, M., Latour, B., 2006. Sociologie de la traduction: textes fondateurs, Collection Sciences sociales. Ecole des mines de Paris.

Amenta, E., Polletta, F., 2019. The cultural impacts of social movements. Annu. Rev. Sociol. 45, 279–299. https://doi.org/10.1146/annurev-soc-073018-022342.

Avelino, F., Dumitru, A., Cipolla, C., Kunze, I., Wittmayer, J., 2020. Translocal empowerment in transformative social innovation networks. Eur. Plan. Stud. 28, 955–977. https://doi.org/10.1080/09654313.2019.1578339.

Bakola, A., 2019. Grassroots innovations for local sustainable development: experiences from ecovillages in Ghana. In: Master Thesis in Globalization and Development Studies. Maastricht University.

Becker, S., Kunze, C., Vancea, M., 2017. Community energy and social entrepreneurship: addressing purpose, organisation and embeddedness of renewable energy projects. J. Clean. Prod. 147, 25–36. https://doi.org/10.1016/j.jclepro.2017.01.048.

Belleze, G., Bernardes, M.E.C., Pimenta, C.A.M., Júnior, P.C.N., 2017. Ecovilas brasileiras e indicadores de desenvolvimento sustentável do IBGE: uma análise comparativa. Ambient. Soc. XX, 227–244. https://doi.org/10.1590/1809-4422ASOC20150164R2V2012017.

Bochinski, L.B., 2015. Alumni of experimental communities: agents of change at a critical time. In: Master Thesis in Anthropology and Social Ecology Prescott College. https://www.academia.edu/19754317/Alumni_of_Experimental_Communities_Agents_of_Change_at_a_Critical_Time.

Boyer, R., 2015. Grassroots innovation for urban sustainability: comparing the diffusion pathways of three ecovillage projects. Environ. Plan. A 47, 320–337. https://doi.org/10.1068/a140250p.

Boyer, R., 2016. Achieving one-planet living through transitions in social practice: a case study of Dancing Rabbit Ecovillage. Sustain. Sci. Pract. Policy 12, 1–6. https://doi.org/10.1080/15487733.2016.11908153.

Boyer, R., 2018. Intermediacy and the diffusion of grassroots innovations: the case of cohousing in the United States. Environ. Innov. Soc. Transit. 26, 32–43. https://doi.org/10.1016/j.eist.2017.08.001.

Brito, E.C., Oliveira, C.M., 2019. Bancos Comunitários de Desenvolvimento e moedas sociais: a experiência pioneira do Banco de Palmas. Rev. Orb. Lat. 9, 23–36. https://revistas.unila.edu.br/orbis/article/view/1582/1613.

Cairns, I., Hannon, M., Braunholtz-speight, T., Mclachlan, C., Mander, S., Hardy, J., Sharmina, M., Manderson, E., 2023. Financing grassroots innovation diffusion pathways: the case of UK community energy. Environ. Innov. Soc. Transit. 46, 100679 https://doi.org/10.1016/j.eist.2022.11.004.

Cajaiba-Santana, G., 2014. Social innovation: moving the field forward. A conceptual framework. Technol. Forecast. Soc. Chang. 82, 42–51. https://doi.org/10.1016/j.techfore.2013.05.008.

Callon, M., 1986. The sociology of an actor-network: the case of the electric vehicle. Mapp. Dyn. Sci. Technol. 19–34. https://doi.org/10.1007/978-1-349-07408-2_2.

Caporal, F., Petersen, P., 2011. Agroecologia e políticas públicas na América Latina: o caso do Brasil. Agroecología 6, 63–74. https://revistas.um.es/agroecologia/article/view/160681.

Daly, M., 2017. Quantifying the environmental impact of ecovillages and co-housing communities: a systematic literature review. Local Environ. 22, 1358–1377. https://doi.org/10.1080/13549839.2017.1348342.

De Vydt, M., Ketelaars, P., 2021. Linking consensus to action: does frame alignment amongst sympathizers lead to protest participation? Soc. Mov. Stud. 20, 439–458. https://doi.org/10.1080/14742837.2020.1770071.

Dias, M.A., Loureiro, C.F.B., Chevitarese, L., Souza, C.D.M.E., 2017. The meaning and relevance of ecovillages for the construction of sustainable societal alternatives. Ambient. e Soc. 20, 79–96. https://doi.org/10.1590/1809-4422ASOC0083V2032017.

dos Santos-Júnior, S.J., 2015. Zelosamente habitando a Terra. Ecovilas genuínas, espaço geográfico e a construção de lugares zelosos em contextos contemporâneos de fronteiras paradigmáticas. Tese de doutorado em Geografia. Universidade Federal da Bahia. https://repositorio.ufba.br/handle/ri/20636.

Earl, J., 2007. The cultural consequences of social movements. In: Blackwell Companion to Soc. Movements, pp. 508–530. https://doi.org/10.1002/9780470999103.ch22.

Feola, G., Butt, A., 2017. The diffusion of grassroots innovations for sustainability in Italy and Great Britain: an exploratory spatial data analysis. Geogr. J. 2017 (183), 16–33. https://doi.org/10.1111/geoj.12153.

Feola, G., Nunes, R., 2014. Success and failure of grassroots innovations for addressing climate change: the case of the transition movement. Glob. Environ. Chang. 24, 232–250. https://doi.org/10.1016/j.gloenvcha.2013.11.011.

Fressoli, M., Arond, E., Abrol, D., Smith, A., Ely, A., Dias, R., 2014. When grassroots innovation movements encounter mainstream institutions: implications for models of inclusive innovation. Innov. Dev. 4, 277–292. https://doi.org/10.1080/2157930x.2014.921354.

Fuenfschilling, L., Truffer, B., 2014. The structuration of socio-technical regimes - conceptual foundations from institutional theory. Res. Policy 43, 772–791. https://doi.org/10.1016/j.respol.2013.10.010.

Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Res. Policy 31, 1257–1274. https://doi.org/10.1016/S0048-7333(02)00062-8.

Goffman, E., 1974. Frame Analysis: An Essay on the Organization of Experience. Northeastern University Press, New York.

Granovetter, M., 1985. Economic action and social structure: the problem of embeddedness. Am. J. Sociol. 91, 481–510.

Hargreaves, T., Hielscher, S., Seyfang, G., Smith, A., 2013a. Grassroots innovations in community energy: the role of intermediaries in niche development. Glob. Environ. Chang. 23, 868–880. https://doi.org/10.1016/j.gloenvcha.2013.02.008.

Hargreaves, T., Longhurst, N., Seyfang, G., 2013b. Up, down, round and round: connecting regimes and practices in innovation for sustainability. Environ. Plan. A 45, 402–420. https://doi.org/10.1068/a45124.

Higgins, V., Dibden, J., Cocklin, C., 2008. Building alternative agri-food networks: certification, embeddedness and agri-environmental governance. J. Rural. Stud. 24, 15–27. https://doi.org/10.1016/j.jrurstud.2007.06.002.

Hossain, M., 2016. Grassroots innovation: a systematic review of two decades of research. J. Clean. Prod. 137, 973–981. https://doi.org/10.1016/j.jclepro.2016.07.140.

Hossain, M., 2018. Grassroots innovation: the state of the art and future perspectives. Technol. Soc. 55, 63–69. https://doi.org/10.1016/j.techsoc.2018.06.008.

Jasper, J.M., 1997. The Art of Moral Protest: Culture, Biography and Creativity in Social Movements. The University of Chicago Press, Chicago.

Jimenez, A., Delgado, D., Merino, R., Argumedo, A., 2022. A decolonial approach to innovation? Building paths towards Buen Vivir. J. Dev. Stud. 1–18 https://doi.org/10.1080/00220388.2022.2043281.

Kasper, D.V.S., 2008. Redefining community in the ecovillage. Hum. Ecol. Rev. 15, 12–24. https://www.jstor.org/stable/24707480.

Kemp, R., Schot, J., Hoogma, R., 1998. Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. Tech. Anal. Strat. Manag. 10, 175–198. https://doi.org/10.1080/09537329808524310.

Koehrsen, J., 2017. Boundary bridging arrangements: a boundary work approach to local energy transitions. Sustainability 9, 1–23. https://doi.org/10.3390/su9030424.

Köhler, J., Geels, F.W., Kern, F., Markard, J., Wieczorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., Mcmeekin, A., Mühlemeiers, M.S., Nykvist, B., Onsongo, E., Pel, B., Raven, R., Rohracher, H., Sandén, B., Schot, J., Sovacool, B., Turnheim, B., Welch, D., Wells, P., 2019. An agenda for sustainability transitions research: state of the art and future directions. Environ. Innov. Soc. Transit. 1–32 https://doi.org/10.1016/j.eist.2019.01.004.

Korjonen-Kuusipuro, K., Hujala, M., Pätäri, S., Bergman, J.P., Olkkonen, L., 2017. The emergence and diffusion of grassroots energy innovations: building an interdisciplinary approach. J. Clean. Prod. 140, 1156–1164. https://doi.org/10.1016/j.jclepro.2016.10.047.

Kunze, I., Avelino, F., 2015. Transformative Social Innovation Narrative of GEN, the Global Ecovillage Network. TRANSIT EU SSH.2013.3.2-1 Grant Agreem. no 613169. http://www.transitsocialinnovation.eu/content/original/Book%20covers/Local%20PDFs/148%20TSI%20Narrative_GEN_Upload.pdf.

Latour, B., 1987. Science in Action: How to Follow Scientists and Engineers Through Society. Harvard University Press.

Liftin, K., 2014. Ecovillages: Lessons for Sustainable Community. Polity Press, Cambridge.

Mafle, L.G.F., Sahakian, M., Leite, J.L.F., 2021. Empowerment in an ecovillage: unveiling the role of power relations in social practices. Community Dev. 1, 1–15. https://doi.org/10.1080/15575330.2021.1923045.

Mattos, T.P., 2015. Ecovilas: a construção de uma cultura regenerativa a partir da práxis de Findhorn, Escócia. Dissertação de mestrado em Psicossociologia de Comunidades e Ecologia Social, Universidade Federal do Rio de Janeiro. http://pos.eicos.psicologia.ufrj.br/wp-content/uploads/2015_MEST_Taisa_Pinho_Mattos.pdf.

Melucci, A., 1996. Challenging Codes: Collective Action in the Information Age. Cambridge University Press, Cambridge.

Morris, O., 2022. How ecovillages work: more-than- human understandings of rentabilidad in Mexican ecovillages. Sustain. Sci. 17, 1235–1246. https://doi.org/10.1007/s11625-022-01162-7.

Murdoch, J., Marsden, T., Banks, J., 2000. Quality, nature, and embeddedness: some theoretical considerations in the context of the food sector. Econ. Geogr. 76, 107–125. https://doi.org/10.2307/144549.

Mychajluk, L., 2017. Learning to live and work together in an ecovillage community of practice. Eur. J. Res. Educ. Learn. Adults 8, 179–194. https://doi.org/10.3384/rela.2000-7426.rela9092.

Namakkal, J., 2012. European dreams, Tamil land: Auroville and the paradox of a postcolonial utopia. J. Study Radicalism 6, 59–88. https://doi.org/10.1353/jsr.2012.0006.

Ornetzeder, M., Rohracher, H., 2013. Of solar collectors, wind power, and car sharing: comparing and understanding successful cases of grassroots innovations. Glob. Environ. Chang. 23, 856–867. https://doi.org/10.1016/j.gloenvcha.2012.12.007.

Orozco-Meléndez, J.F., Paneque-Gálvez, J., 2022. A role for grassroots innovation toward agroecological transitions in the Global South? Evidence from Mexico. Ecol. Econ. 201 https://doi.org/10.1016/j.ecolecon.2022.107582.

Pel, B., Haxeltine, A., Avelino, F., Dumitru, A., Kemp, R., Bauler, T., Kunze, I., Dorland, J., Wittmayer, J., Søgaard, M., 2020. Towards a theory of transformative social innovation: a relational framework and 12 propositions. Res. Policy 49, 13. https://doi.org/10.1016/j.respol.2020.104080.

Pfotenhauer, S., Laurent, B., Papageorgiou, K., Stilgoe, J., 2022. The politics of scaling. Soc. Stud. Sci. 52, 3–34. https://doi.org/10.1177/03063127211048945.

Pisters, S.R., Vihinen, H., Figueiredo, E., 2020. Inner change and sustainability initiatives: exploring the narratives from eco-villagers through a place-based transformative learning approach. Sustain. Sci. 15, 395–409. https://doi.org/10.1007/s11625-019-00775-9.

Polanyi, K., 2001. The Great Transformation: The Political and Economic Origins of Our Time. Beacon Press, Boston.

Polletta, F., 1998. "It was like a fever …" narrative and identity in social protest. Soc. Probl. 45, 137–159. https://doi.org/10.1525/sp.1998.45.2.03x0163g.

Polletta, F., 2008. Culture and movements. Ann. Am. Acad. Pol. Soc. Sci. 619, 78–96. https://doi.org/10.1177/0002716208320042.

Ramirez, M., Estevez, J.H.G., Goyeneche, O.Y.R., Rodriguez, C.E.O., 2020. Fostering place-based coalitions between social movements and science for sustainable urban environments: a case of embedded agency. Environ. Plan. C Polit. Sp. 38, 1386–1411. https://doi.org/10.1177/2399654420929355.

Reuber, A.R., Tippmann, E., Monaghan, S., 2021. Global scaling as a logic of multinationalization. J. Int. Bus. Stud. 52, 1031–1046. https://doi.org/10.1057/s41267-021-00417-2.

Roysen, R., Cruz, T.C., 2020. Educating for transitions: ecovillages as transdisciplinary sustainability "classrooms". Int. J. Sustain. High. Educ. 21, 977–992. https://doi.org/10.1108/IJSHE-01-2020-0009.

Roysen, R., Mertens, F., 2019. New normalities in grassroots innovations: the reconfiguration and normalization of social practices in an ecovillage. J. Clean. Prod. 1–8 https://doi.org/10.1016/j.jclepro.2019.117647.

Roysen, R., Schwab, A.-K., 2021. The potential of ecovillages for transitions in rural areas: a comparison of ecovillages in Germany and Brazil. In: Climate Adaptation: Accounts of Resilience, Self-sufficiency and Systems Change. Arkbound Foundation, Glasgow, pp. 231–249.

Schögler, R., 2017. Sociology of translation. In: Korgen, K.O. (Ed.), The Cambridge Handbook of Sociology. Cambridge University Press, pp. 399–407. https://doi.org/10.1017/9781316418369.042.

Schweizer, T., 1997. Embeddedness of ethnographic cases: a social networks perspective. Curr. Anthropol. 38, 739–760. https://doi.org/10.1086/204665.

Sengers, F., Turnheim, B., Berkhout, F., 2021. Beyond experiments: embedding outcomes in climate governance. Environ. Plan. C Polit. Sp. 39, 1148–1171. https://doi.org/10.1177/2399654420953861.

Seyfang, G., 2010. Community action for sustainable housing: building a low-carbon future. Energy Policy 38, 7624–7633. https://doi.org/10.1016/j.enpol.2009.10.027.

Seyfang, G., Gilbert-Squires, A., 2019. Move your money? Sustainability transitions in regimes and practices in the UK retail banking sector. Ecol. Econ. 156, 224–235. https://doi.org/10.1016/j.ecolecon.2018.09.014.

Seyfang, G., Haxeltine, A., 2012. Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions. Environ. Plan. C Gov. Policy 30, 381–400. https://doi.org/10.1068/c10222.

Seyfang, G., Longhurst, N., 2013. Desperately seeking niches: grassroots innovations and niche development in the community currency field. Glob. Environ. Chang. 23, 881–891. https://doi.org/10.1016/j.gloenvcha.2013.02.007.

Seyfang, G., Longhurst, N., 2016. What influences the diffusion of grassroots innovations for sustainability? Investigating community currency niches. Tech. Anal. Strat. Manag. 28, 1–23. https://doi.org/10.1080/09537325.2015.1063603.

Seyfang, G., Smith, A., 2007. Grassroots innovations for sustainable development: towards a new research and policy agenda. Environ. Polit. 16, 584–603. https://doi.org/10.1080/09644010701419121.

Seyfang, G., Park, J.J., Smith, A., 2013. A thousand flowers blooming? An examination of community energy in the UK. Energy Policy 61, 977–989. https://doi.org/10.1016/j.enpol.2013.06.030.

Sherry, J., 2019. The impact of community sustainability: a life cycle assessment of three ecovillages. J. Clean. Prod. 237 https://doi.org/10.1016/j.jclepro.2019.117830.

Shiga, J., 2007. Translations: artifacts from an actor-network perspective. Artifact 1, 40–55. https://doi.org/10.1080/17493460600658318.

Shove, E., Pantzar, M., Watson, M., 2012. The Dynamics of Social Practice: Everyday Life and How It Changes. SAGE Publications Ltd, London. https://doi.org/10.4135/9781446250655.n1.

Skanavis, C., Manolas, E., 2015. School gardens and ecovillages: innovative civic ecology educational approaches at schools and universities. In: Leal Filho, W. (Ed.), Transformative Approaches to Sustainable Development at Universities. Springer, pp. 559–570. https://doi.org/10.1007/978-3-319-08837-2_37.

Smith, A., 2007. Translating sustainabilities between green niches and socio-technical regimes. Tech. Anal. Strat. Manag. 19, 427–450. https://doi.org/10.1080/09537320701403334.

Snow, D.a., Rochford, E.B., Worden, S.K., Benford, R.D., 1986. Frame alignment processes, micromobilization, and movement participation. Am. Sociol. Rev. 51, 464. https://doi.org/10.2307/2095581.

Sonnino, R., 2007. Embeddedness in action: saffron and the making of the local in southern Tuscany. Agric. Hum. Values 24, 61–74. https://doi.org/10.1007/s10460-006-9036-y.

Sonnino, R., Marsden, T., 2006. Beyond the divide: rethinking relationships between alternative and conventional food networks in Europe. J. Econ. Geogr. 6, 181–199. https://doi.org/10.1093/jeg/lbi006.

Stanfield, J.R., 1980. The institutional economics of Karl Polanyi. J. Econ. Issues 14, 593–614. https://www.jstor.org/stable/4224945.

Strang, D., Soule, S. a, 1998. Diffusion in organizations and social movements: from hybrid corn to poison pills. Annu. Rev. Sociol. 24, 265–290. https://doi.org/10.1146/annurev.soc.24.1.265.

Stüwe, C., 2009. Diffusion of sustainability innovations around Lynedoch EcoVillage. In: Master Thesis in Sustainability Economics and Management. Universität Oldenburg. http://oops.uni-oldenburg.de/917/.

Tindall, D.B., Piggot, G., 2015. Influence of social ties to environmentalists on public climate change perceptions. Nat. Clim. Chang. 1–4 https://doi.org/10.1038/nclimate2597.

Tsing, A.L., 2012. On nonscalability: the living world is not amenable to precision-nested scales. Common Knowl. 18, 505–524. https://doi.org/10.1215/0961754X-1630424.

Turnheim, B., Kivimaa, P., Berkhout, F., 2018a. Beyond experiments: innovation in climate governance. In: Turnheim, B., Kivimaa, P., Berkhout, F. (Eds.), Innovating Climate Governance: Moving Beyond Experiments. Cambridge University Press, Cambridge, pp. 1–26.

Turnheim, B., Kivimaa, P., Berkhout, F., 2018b. Experiments and beyond: an emerging agenda for climate governance innovation. In: Turnheim, B., Kivimaa, P., Berkhout, F. (Eds.), Innovating Climate Governance: Moving Beyond Experiments. Cambridge University Press, Cambridge, pp. 216–241.

Venkitaraman, A.K., Joshi, N., 2022. A critical examination of a community-led ecovillage initiative: case of Auroville, India. Clim. Action 1, 1–9. https://doi.org/10.1007/s44168-022-00016-3.

VERBI Software, 2021. MAXQDA 2022 [Computer Software].

Vestrum, I., 2014. The embedding process of community ventures: creating a music festival in a rural community. Entrep. Reg. Dev. 26, 619–644. https://doi.org/10.1080/08985626.2014.971076.

Westskog, H., Winther, T., Aasen, M., 2018. The creation of an ecovillage: handling identities in a Norwegian sustainable valley. Sustainability 10. https://doi.org/10.3390/su10062074.

Whittier, N., 2007. The consequences of social movements for each other. In: Snow, David A., Soule, Sarah A., Kriesi, Hanspeter (Eds.), The Blackwell Companion to Social Movements. Blackwell Publishing, pp. 531–551. https://doi.org/10.1002/9780470999103.ch12.

Wiest, F., Gamarra Scavone, M.G., Newell, M.T., Otto, I.M., Ringsmuth, A.K., 2022. Scaling up ecovillagers' lifestyles can help to decarbonise Europe. Sustainability 14. https://doi.org/10.3390/su142013611.

Wigren-Kristoferson, C., Brundin, E., Hellerstedt, K., Aggestam, M., 2022. Rethinking embeddedness: a review and research agenda. Entrep. Reg. Dev. 34, 32–56. https://doi.org/10.1080/08985626.2021.2021298.

Wilson, C., 2012. Up-scaling, formative phases, and learning in the historical diffusion of energy technologies. Energy Policy 50, 81–94. https://doi.org/10.1016/j.enpol.2012.04.077.

Wittmayer, J., Backhaus, J., Avelino, F., Pel, B., Strasser, T., Kunze, I., Zuijderwijk, L., 2019. Narratives of change: how social innovation initiatives construct societal transformation. Futures 112, 1–12. https://doi.org/10.1016/j.futures.2019.06.005.

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