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Article

How Does Systemic Design Facilitate the Sustainability Transition of Rural Communities? A Comparative Case Study between China and Italy

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Abstract: Rural sustainability has emerged as a ‘wicked problem’ for practitioners within and outside design. Many efforts that adopted a systematic approach since the 1980s paved the road for addressing such a systemic problem. Moreover, stakeholders from the systemic design field have made significant strides by developing a systemic approach to rural systems since 2012 and implementing numerous localised design practices globally. Despite these efforts, the essence of systemic design for sustainable rural development remains relatively unclear because of its infancy. Therefore, this study tries to answer the question of “how does systemic design facilitate the sustainability transition of rural communities” by conducting field visits to two typical systemic design projects: Future Village Lab in rural China (Tieniu Village) and Systemic Design Lab in Italy (Ostana). Thereafter, drawing on insights from organisational management studies, this study pioneers a novel theoretical framework called ‘Situation-Cognition-Action’ to compare and analyse these two cases. The results highlight the role of systemic design in contributing to rural sustainability by enhancing the understanding of complex situations, fostering cognitive capacity, and creating a solution ecosystem for collaborative action. Finally, it elucidates how systemic design addresses three crucial trade-offs and effectively promotes rural sustainability in various rural contexts.

Keywords: comparative research; case study; systemic design; localised practices; rural sustainability



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1. Introduction

Today’s society is characterised by rapid technological changes, global public-health challenges, and dissolving economic ties. These issues are interconnected and interdependent on one another, which pose significant challenges to the achievement of the Sustainable Development Goals, particularly in rural areas. The old model of urban-centred development is no longer adequate to address such complex social-systemic problems, which are further exacerbating the rigid division between urban and rural areas [1]. Instead of viewing the rural and the urban as two contrasting and competing categories, sustainability in the contemporary era requires a paradigm shift towards a planetary system; in this system, rural and urban systems are vital components, and ruralisation and urbanisation are intersecting and co-evolving at the planetary scale [2]. As important nodes of the planetary networks of materials, resources, information, talent, and knowledge that are connected through multidirectional flows, rural systems are becoming the heartland of sustainability efforts rather than merely the hinterland of urban areas [3]. However, sustainability requires a harmonious coexistence between human beings and nature and the synergistic development of cultural wisdom and the local economy [4]; therefore, the idea of rural sustainability has become a systemic problem sets [5]. Accordingly, while

addressing the issue of sustainability in rural communities, several interdependent issues, including ecological protection, environmental advancement, social prosperity, human empowerment, and value creation for agriculture, must be considered. The consequence of this is rural system sustainability qualifying as a ‘wicked problem’, one that defies easy problem-solving and necessitates the collaborative efforts of diverse actors [6].

Researchers and practitioners have made unremitting endeavours, from ‘problematique’ to ‘solutionatique’ [7], to address the wickedness of rural sustainable development. Some of them, such as Salvia and Quaranta (2017) [8], have recognised the potential of systems-related theories for conceptualising rural problems by drawing on the social systems methodology (SSM) [9] and social-ecological systems (SES) approach [10]. Meanwhile, other scholars have been aware that design-driven practices can create solutions for the transformation of rural systems, especially practices through co-design [11] or participatory design [12]. Hence, systems thinking and design thinking are two of the most important thought approaches that practitioners can adopt to tackle such systemic problems [13]. Since 2012, systemic design, which combines design thinking and systems thinking, has gained prominence [14]. It is defined as a next-generation approach to advancing design-led practices while solving systemic problems [15]. Thereinto, systems thinking provides a holistic and ecological approach to comprehending complex situations [16], while design thinking is a deliberate and intuitive endeavour to establish meaningful order [17]. Here systemic design is different to systems design in that the latter is linear and treats systems merely as objects to be designed, whereas systemic design is iterative and a modifier of design [15]. Even though there is no fixed methodology for such an emerging, pluralistic approach [18], there are general frameworks or broad guidelines for systemic design, such as the three-level connotations of ‘mindset, methodology, and method’ [19], five principles [20], holistic diagnosis for problem framing [21], or the ‘5Ps’ practice framework [14]. These general frameworks have been validated, developed and popularised in various contexts and fields in practice. The fields of healthcare [22], textile [23], and circular economy [24], each with their own practice logic developed from a systemic design, have witnessed high flexibility and powerful vitality of systemic design in providing interconnected solutions for complex scenarios. Therefore, in essence, it is important to analyse systemic design within a specific problem domain.

Although the term systemic design has not been widely nor sufficiently understood in rural community research until now, various efforts for rural development that have adopted systemic approaches emerged since the 1970s. Starting in 1979, Japan promoted endogenous rural development using a strategy named One Village, One Product Movement (OVOP), which aimed at defining product specialities for each village by adopting a community-based approach [25]. The systemic of OVOP lies in the combination of re-shaping the identity of rural communities and promoting economic prosperity [26]. Later in Japan and Taiwan, China, a more systematic Comprehensive Community Building (CCB) initiative gained prominence with the increasing demands for participation in rural communities [27]. CCB initiatives help to balance out rural sustainability by integrating rural societies, agri-economics, and cultural landscapes [28]. In South Korea, a similar systematic initiative called Comprehensive Rural Village Development Program (CRVDP) beginning in the early 2000s is noted as a representative endogenous rural development strategy [29]. Since 2017, the Rural Revitalization Strategy (mainland China) has introduced the 20-word general requirements of industrial prosperity, ecological liveability, civilised rural style, effective governance, and a rich life [30]. Each strategy above in Asia involves systemic initiatives that require stakeholders to consider the linkages among various rural factors and search for synergy of separate programs [31]. Both place-making [32] and art-empowerment [33] can be taken as breakthrough points and effective processes to bring together separate initiatives under the common goal of sustainable rural development. In Europe, the strategy used to improve rural sustainability was named rural renaissance, and it claimed that positive transformation could be derived from the interaction between stimulation systems (outsiders) and acquisition systems (insiders) [34]. European researchers

took the resilience community, which treats resilience as a systematic concept, as a critical feature of the pursuit of rural sustainability [35]. It is well-recognised that place-based approaches would be necessary for building rural resilience [36]. In conclusion, although different strategies with various approaches emerged under distinct rural contexts, endogenous development [37] has been consistently used as the basic pathway for rural revitalisation, with locality studies and systemic initiatives being common elements of such development. On the one hand, locality studies were used to build a ‘sustainable society’ and privileged local attachment and use these constructs as powerful sources of transformative action [38]. On the other hand, systemic initiatives contribute to community resilience and flexibility. Although these ideas coincided with systemic design and paved the road for us to understand this type of design, the core conceptualisations for the application of this type of design to sustainable rural development relatively remains unclear.

Although a systemic design may be capable of addressing the challenges of rural sustainability—which plague complex sociotechnical systems—there is a lack of evidence in past studies on how this can be achieved. The various and strikingly different actors that have evolved in rural areas challenge practitioners engaged in improving rural systems, as each actor comes with their resources, values, and interests [39]. Therefore, practitioners engaged in rural sustainability must not only interpret the complex situation and develop intervention solutions [40] but also reconcile relationships between multiple stakeholders, foster cross-sectoral dialogue, and empower diverse actors [41]. One of the most important roles of a practitioner who adopts a systemic approach to sustainable rural development is to generate a trustful environment, that is, an environment where local actors can actively participate in bottom-up activities [42]. Therefore, the practitioner, who is responsible for the process and outputs of systemic design, plays a role comparable to that of a manager in an organisation. The current study pioneers a perspective from management science to analyse systemic design activities. It attempts to explore how systemic design can help rural communities achieve sustainability transitions by considering systemic design as a management tool.

In order to answer the question of ‘How systemic design facilitates sustainability transitions of rural communities’ from an organisational management perspective, this study first constructs a theoretical framework of ‘Situation–Cognition–Action’. In this framework, organisational management provides a bilingual sensibility to bridge the gap between systemic design practices in rural communities and how we interpret their impact on rural sustainability transitions. Further, to support the theoretical framework proposed earlier, this study conducts a comparative analysis of systemic design practices under two distinct rural contexts in China and Italy. Finally, it discusses three trade-offs involved in the implementation of systemic design practices based on a comparative analysis of the two design practices. These trade-offs elucidate how systemic design can be better used to address the wickedness of sustainability transitions under different rural contexts.

2. Theoretical Framework

A sustainability transition is a dynamic process during which collaborative efforts from various stakeholders lead to reflective interactions [43]. In an organic system, such as a rural community, design can facilitate knowledge management [44] and stakeholder management [45] through a dynamic process and with the help of various interfaces. Most crucially, a design that adopts a systemic approach rather than a traditional, linear approach is a pluralistic, iterative initiative in which different approaches and methodologies thrive [46]. As mentioned earlier, in rural communities, a practitioner who adopts a systemic approach and oversees a sustainability transition performs a role akin to that of a manager in an organisation. According to studies on organisational management, an action strategy can only be developed after performing an organisational situation analysis, with managerial cognition playing a crucial role in directing the entire action process [47]. Following this logic of ‘Situation-Cognition-Action’ implicit in organisational management theory, Figure 1

visualises how systemic design, as an action- and system-oriented approach, can facilitate sustainability transitions in rural communities from a multi-level perspective.

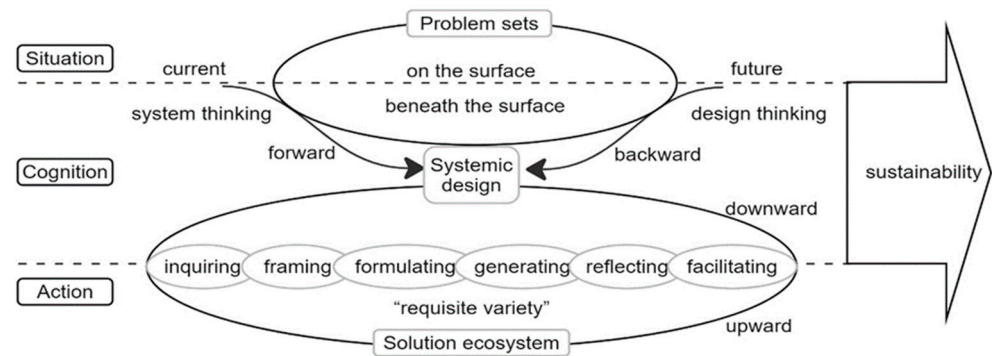


Figure 1. The ‘Situation-Cognition-Action’ framework of systemic design.

2.1. Deepening the Understanding of Complex Situations

Practitioners that follow a systemic approach are concerned with finding ways to help rural communities transition from their current situation to a more sustainable society, ecology, and economy by honouring their cultural values and technology roles [48]. Given that rural communities often retain much of their local knowledge, traditional lifestyles, and cultural heritage [49], their environment is more than what we may initially observe on the surface. The findings of organisational management studies indicate that the environment influences the ultimate action strategy, both through attention focus and causal logic [50]. Attention focus involves focusing on critical domains when a piece of strategic information exceeds a manager’s cognitive capacity [51]. This approach is highly useful while addressing a wicked problem, such as the sustainability transition of a rural community. In this approach, practitioners must initially identify or mine a specific topic based on their understanding of wicked problems that exhibit indeterminacy and ambiguity and comprise various sub-issues [52]. By contrast, causal logic guides us to determine causal entanglements that may affect how strategic decisions are made, understood and communicated [53]. Causal logic describes how systemic designers perform their roles. Common strategies include re-understanding the design object by looking far beyond it and eventually mapping out the system, its environment (direct interactions), and the bigger landscape (indirect interactions) in which the system and its environment are embedded [54].

In the context of rural sustainability transition, at the surface level, ‘sustainability’ refers to a range of problem sets that include causal entanglements of economic development, cultural prosperity, and ecological conservation. Meanwhile, beneath the surface, various linkages exist, such as the rural values and localised knowledge embedded in the rural public space. Based on these descriptions, systemic design can enhance one’s understanding of complex situations regarding sustainability in rural communities in two ways: first, by dissolving the indeterminacy and finding a leverage point for promoting rural sustainability via attention focus; second, by reimagining the complex causal logic between various elements in a rural community, and between the rural system and the bigger system it operates in or it interacts with (e.g., the urban system).

2.2. Building Cognitive Capacity to Address Complexity

To make progress amid complexity, systemic practitioners require an effective way of thinking or cognition. Managerial cognition is an information-filtering process through which rational managers translate their knowledge structures to select strategies and make decisions based on their understanding of changes in organisational circumstances [50]. It can effectively guide follow-up action strategies [55]. In systemic design, managerial cognition offers an interdisciplinary approach emphasising selective attention and effect cause analysis, which differs slightly from the approaches used in organisational management. In

particular, a systemic design provides designers or practitioners with efficient managerial cognition to confront complexity and take action because it is an organic convergence between systems thinking and design thinking [56]. A systemic designer first takes a step backwards from 'design' to systems thinking, which involves perceiving, modelling, and intervening in the world as if it were composed of open, purposeful, complex wholes [19]. Subsequently, by moving a step forward from 'system-thinking' to design thinking in a normative, user-centred, and iterative manner, the application of the design can then be extended beyond symbols, objects, and interactions [57]. A practitioner or designer adopting a systemic approach, similar to a manager, must build, integrate, reconfigure, and manage a wide range of resources [58]. Further, they must do so while using the cognitive capabilities of pattern recognition, situation interpretation, and visual presentation [42].

A rural community is an ecology consisting of the environment, economy, culture, and management. Because of these various elements, this ecology often induces designers or practitioners to be overloaded by managerial tasks and processes, as they must monitor a dynamic design process to facilitate a sustainability transition. By converging systems science and design philosophy, systemic design can address the cognitive overload that these stakeholders may experience when seeking solutions. Specifically, the systems thinking aspect of systemic design helps to perceive and interpret the complex relationships between multiple factors in a rural community at the ecological, social, technical, and economic levels from a dynamic and holistic perspective. In contrast, the design thinking approaches of ideation, prototyping, and iteration, which are also featured in a systemic design, make these complex relationships and potential strategies more accessible by integrating transdisciplinary methods and tools.

2.3. Creating a Solution Ecosystem for Collaborative Action

As a global approach, design, especially systemic design, is biased toward undertaking action [59]. This is consistent with the principles of dynamic management, which requires managers to adopt various action strategies at different stages through resource orchestration and reconfiguration [60]. Drawing on the philosophy of dynamic management, a designer or practitioner attempts to develop a set of systemic and innovative action strategies through an iterative process of enquiring, framing, formulating, generating, reflecting, and facilitating [19]. During this process, maximising the advantages of 'self-organising' and 'generative emergence' provide designers with as much 'requisite variety' [61] as possible. This requisite variety stems from the integration of transdisciplinary methods and tools [62] and the convergence and divergence of broad domains of design [63]. During this iterative process, the solution ecosystem has two pathways: (1) downward, based on its targeting capacity, which means that each action or the combined actions in the solution ecosystem, addresses one or more of the causal factors in the problem sets through self-organisation; (2) upward, by leveraging the emergence nature and producing the 'cascade effect', in which the first initiative leads to the creation of many other initiatives beyond one's expectations.

The sustainability transition of rural communities as an organic and dynamic system of economic development, cultural prosperity, and ecological conservation is a social agreement that calls for collaborative action from multiple sectors. This collaborative action requires a systemic designer to integrate knowledge and resources from multiple sectors through an iterative design process involving enquiring, framing, formulating, generating, reflecting, and facilitating. During this iterative process, systemic design, as an action-oriented approach, can integrate dialogue in co-creation for sensemaking and decision-making [64]. Additionally, as systemic design implies the absence of a fixed method, it is precisely this openness that determines whether it can amass palette support from brand, planning, cultural and creative, service, and social designs to tackle the complexity of rural sustainability in both downward and upward pathways.

3. Materials and Methods

3.1. Materials

This study investigates how systemic design practices can facilitate rural sustainability transitions. Rural communities vary greatly from one political and social context to another, and even communities in the same country can vary considerably, depending on their geographical and economic differences. This variability of contexts should be considered when analysing the mechanism through which systemic design facilitates rural sustainability. Therefore, this study selects two systemic design practices from rural communities in China and Italy (See Table 1). The practice from China stems from the pilot project named the Future Village Lab, which focused on the experiment with ecological agriculture. The practice from Italy is run by the Monviso Institute through the Systemic Design Lab for the exploration of the regenerative community. These two practices in rural contexts provide research materials for understanding systemic design for sustainable rural development.

Table 1. Comparative descriptions of two systemic design practices.

Framework	Tieniu Village	Ostana Village
Rural context	Tieniu Village, Pujiang County, Chengdu City, Sichuan Province, Western China.	Ostana Village, Cuneo City, Torin Province, Piedmont Region, North-western Italy.
Geographical similarity	Lies within a one-hour economic circle of the capital of the Sichuan Province, Chengdu.	Lies within a one-hour economic circle of the capital of the Piedmont region, Turin.
Start of the project	In 2017, the coordinator of the project, Shi, was invited by the local government of Pujiang County to implement a rural-design project.	In 2015, the coordinator of the project, Luthe, identified this mountain village while exploring Torino valleys.
Aim of the project	Experimenting with ecological agriculture.	Regenerative community exploration.
Development path	Bringing in capital and new talent to build a platform for co-creation.	Bringing in capital and new talent to build a platform for co-creation.
Management model	Endogenous management via a rural cooperative organisation, Tieniu Choumei Ltd., Chengdu, China	Exogenous management via a real-world laboratory, Monviso Institute.

3.2. Methods

A comparative case study design is suitable for this study because it allows for reflecting on the differences between cases while ensuring their comparability. Concerning the sample selection for the comparative case study, the two practices from China and Italy highlight the differences in the rural contexts of each country. Furthermore, regarding case comparability, the two rural communities, Tieniu Village and Ostana Village, where the systemic design practices are conducted, have similar geographical characteristics (See Table 1). Tieniu Village and Ostana Village are located within the one-hour economic circle of Chengdu and Turin, respectively. One-hour economic circle refers to the formation of an area with a clear agglomeration effect, with a major city as the core (e.g., Chengdu or Turin in our article), within one hour of accessibility. It indicates the radiation effect of the major city on the surrounding urban or rural areas.

After considering the diversity of the rural contexts of the samples and confirming the similarity of their geographical characteristics, we conducted field visits and semi-structured interviews to obtain as detailed and realistic data as possible. On 9 February 2023 (China time), and 13 February 2023 (Italy time), we carried out field visits in the

villages of Tieniu and Ostana, respectively. We conducted approximately 3 h of interviews and communications with the designers in each systemic design practice. During the field visits, we paid attention to the new rural systems that the practitioners had constructed using systemic design and the creative relationships among different rural factors for a sustainability transition. In the face-to-face, semi-structured interviews with the coordinators of each project, we questioned them about how they developed the systemic projects, how they unearthed potential factors and stakeholders, how they connected factors with sustainability vision, and what was the solution ecosystem for sustainability. This method and the questions used enable us to understand, to the furthest extent possible, the managerial cognition of coordinators in rural systemic projects and the action strategies they develop and adopt for rural sustainability. Last, we conducted a comparative analysis using the Situation-Cognition-Action framework to validate it and draw commonalities embedded in the two systemic design practices.

3.3. Indicators

As mentioned in Section 1, there have been many attempts to apply systematic thinking in rural communities since the late 1970s. Therefore, we can tease out key indicators of rural sustainability from these systemic practices.

The most widely known is the One Village, One Product Movement in Japan [25]. Following Japan, Thailand and Vietnam promoted the One Tambon One Product Project [65] and One Commune One Product [66] in their villages, respectively. They all aim to create one marketable product in each community concerning their local resources to achieve endogenous industrial development [67]. Since the 1990s, many villages have turned towards nature-based tourism as a ‘potential saviour’ from the effects of depopulation, ageing, and decreasing agricultural profitability [68]. This kind of shift makes agriculture become a value-added industry [69]. In recent years, the bioeconomy [70] and circular economy [71] have provided a potential pathway to sustainable growth by capturing the latent value in biological processes and achieving a circular loop. Therefore, the bioeconomy and circular economy is advanced forms of endogenous industrial development by developing both products and services matched to local assets and resources.

Community empowerment is another critical aspect of local development. As early as the 1970s, the Saemaul Undong (SMU) in Korea operated on the principles of ‘by the people, for the people, and of the people’ to nurture community leadership and locals’ capacity-building [72]. Later, both Comprehensive Community Building (CCB) in Japan and Taiwan, China, and CRVDP initiative in South Korea aimed not only to promote industrial development but more to save the decaying community by empowering them. In particular, CCB empowers communities by employing artistic intervention, industrial guidance, and spatial transformation [27], while the CRVDP initiative in South Korea operates mainly by the local autonomy that enables the local government to be “more accountable and responsive” to the local demand [73]. It can be seen that community empowerment and rural governance are mutually beneficial.

The pillar for industrial development and community empowerment is rurality. CCB in Japan, Hong Kong, and Taiwan promotes sustainable community development by integrating the five values of ‘people, culture, land, landscape and production’ [74]. One vivid example of such integration is placemaking, whose critical challenge of placemaking is to ‘encourage citizens to rediscover the uniqueness of their lifestyles and regional culture to plan a thriving and liveable community’ [75]. Apart from placemaking, many similar rural initiatives, such as agrotourism and heritage inheritance, spin local character into economic renewal by taking the countryside as a place rich in unique resources and rediscovering rural values [37].

Whether in Japan, South Korea, China, or Europe, these localised rural practices are usually inseparable from social networking services (SNS), as these SNS are expected to promote social networking and mobilise social capital and social interaction [76]. Social

networking and social capital are beneficial for community empowerment and governance, which in turn result in endogenous industrial development.

The descriptions above led us to define five critical indicators of systemic practices in rural areas (See Table 2): social networking service, uniqueness and values in rurality, community empowerment and governance, industrial development, and circular economy or bioeconomy for sustainability.

Table 2. Several critical indicators of systemic practices for rural sustainability.

Indicators	Descriptions
1. Social networking service (SNS)	A local platform or alliance is constructed to gather social resources, promote social interaction, and guide the whole systemic design process.
2. Uniqueness and values in rurality	Systemic design takes the countryside as a place rich in unique resources and aims to rediscover the values of rural ecology, economy, and culture.
3. Community empowerment and governance	Community empowerment and governance act as both the objects of sustainable rural development and processes of achieving endogenous development.
4. Endogenous industrial development	Endogenous industrial development is the primary goal of systemic practices for rural development and makes the foundation for other sustainable goals.
5. Circular economy or bioeconomy for sustainable growth	Design a circular loop to connect systemic factors and address causal entanglements for sustainable growth, usually through an industrial linkage or a bio-regional circular economy.

4. Results of the Comparative Case Study

4.1. Future Village Lab for Ecological Agriculture, China

Tieniu Village is an example of a typical countryside near Chengdu City, Sichuan Province, China. Thanks to the work of the Future Village Lab, Tieniu Village is now one of the 25 pilot villages in the Future Park Community project of Chengdu City. The Future Village Lab for ecological agriculture is operated by Shi Guoping, who was initially invited by the local government of Pujiang County to conduct a rural design project for Tieniu Village in 2017. Considering Tieniu Village's geographical proximity to Chengdu and its population of more than 3000 residents, Shi decided to implement a systemic design rather than merely a rural landscape design. Of the three factors of sustainability—plants, people, and profit—which correspond to ecology, society, and the economy, respectively, Tieniu Village has a simple ecology with a beautiful landscape. Taking ecology as a leverage point, Shi's systemic approach involved localised actions regulating the relationship between money, people, and land, whose combined impact revived Tieniu Village (See Figure 2).

1. Instituting a localised enterprise, Choumei Field Resorts Ltd., Chengdu, China:

At the outset, systemic designer Shi Guoping collaborated with locals to institute a localised enterprise, Choumei Field Resorts Ltd., Chengdu, China. The enterprise is owned and managed by a rural cooperative of villagers and welcomes external capital and talents. Through the institution of Choumei Field Resorts Ltd., Chengdu, China, a rural social community was reshaped, as the locals partook in the institution with land and human power and outsiders with capital and technology. This operation not only helped attract external capital and wisdom to develop the local economy but also stimulated the endogenous motivation of the rural community and the initiative of locals.

2. Identifying the value of rural ecology, economy, and culture:

This involved tapping into the economic potential and ecological value of locally produced citrus oranges. An unused village public space was redesigned, and its social

value was reclaimed by transforming it into a low-carbon living experience hall, all without changing its emblematic architectural style. At the outset of the project, the low-carbon living experience hall was a communicative place for locals and outsiders, and it eventually became a local platform for organising cultural activities related to low-carbon living. These activities included garden celebrations, low-carbon lectures, the market for low-carbon agricultural products, and exhibitions for cultural and creative products.

3. Incubating professional service institutions:

Choumei Field Resorts Ltd., Chengdu, China incubated several professional institutions, which serve six major areas: ecological agricultural development, local culture creation, rural landscape creation, rural entrepreneurship support, community development, and governance. These institutions professionalised various activities for sustainable rural development, enabling professionals in Tieniu Village to achieve healthy career growth and broaden their prospects. Thus, this arrangement incentivised talented people to become new villagers, to stay in Tieniu Village for long and stable periods, and improved the local community capacity.

4. Development of ecological agriculture based on citrus oranges:

Tieniu Village had a history of growing citrus oranges for over 40 years. However, the use of chemical fertilisers and pesticides at the local level was unsustainable. This led to the development of ecological agriculture based on citrus oranges, to become the breaking point for achieving sustainability. In the local citrus orchard, activities such as chickens, other poultry, and sheep feeding were combined with citrus orange planting to form an ecological circle by practising traditional low-carbon breeding methods (e.g., composting and returning to the field). Furthermore, the use of traditional low-carbon breeding methods attracted an increasing number of tourists to experience low-carbon living.

5. Linking primary, secondary, and tertiary industries with citrus production:

The primary industry of agricultural production was revitalised based on traditional agricultural planting and farming, with citrus oranges as the core. On this basis, secondary industries centred around citrus oranges, such as orange jam factories, beverage processing, and citrus essential oil production, were developed locally with external capital support. The beautiful ecological landscape and ecological tradition-lifestyle practised in Tieniu Village attracted the urban population to visit the village to experience low-carbon living. Thus, related service industries have developed, including the Citrus Oranges Essential-Oil Experience Hall; Citrus Oranges Jam-Experience Workshops; vegetarian restaurants, hotels, and diners; and study bases for corporate team-building events. At different stages of the industrial linkage, different service institutions are responsible for orange packaging, providing cultural and ecological experiences, and designing the landscape of the orange gardens. The circularity of this industrial linkage is profitable for professional service institutions and creates opportunities for the locals and new villagers in Tieniu Village to diversify their incomes.

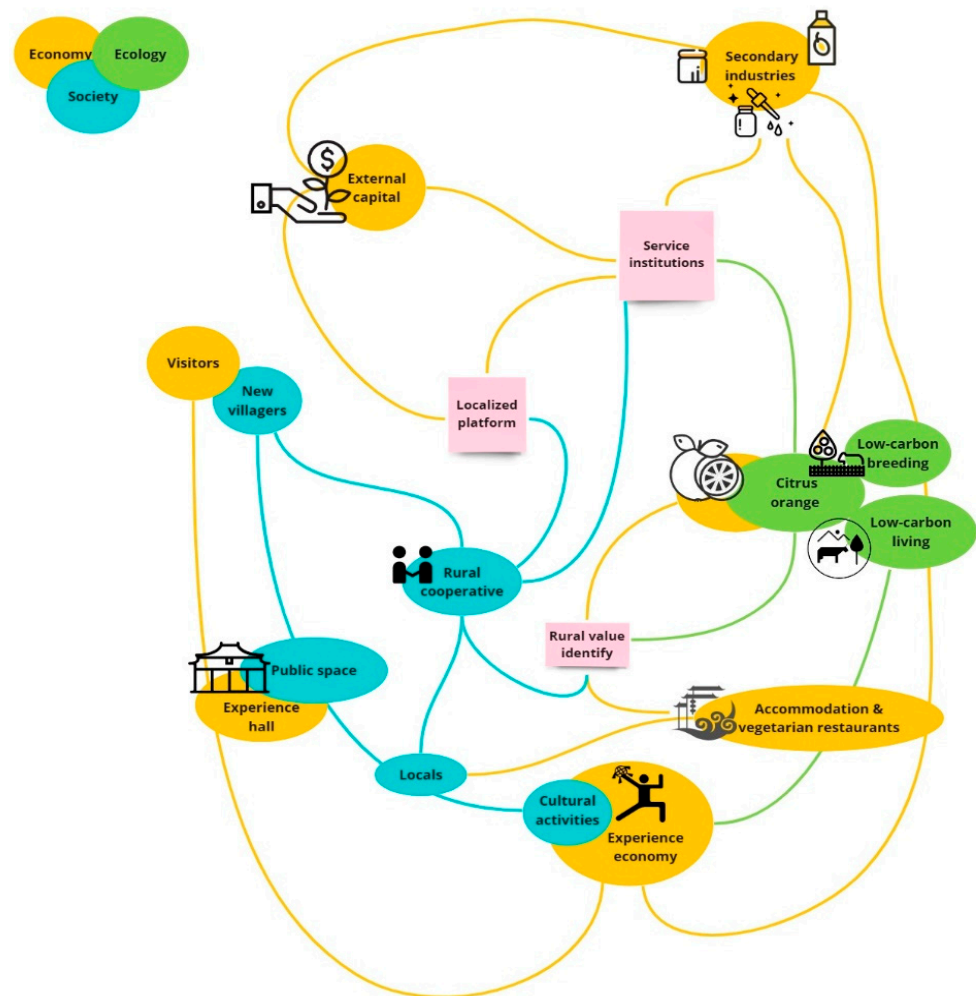


Figure 2. Future village lab for ecological agriculture.

4.2. Systemic Design Lab for Community Regeneration, Italy

Ostana is a relatively isolated Occitan village located at the foot of Monte Viso, Italy. By the end of the twentieth century, it was at great risk of decline because its population had shrunk from approximately 1300 to only 5. A new, vibrant community of more than 40 permanent residents has been reviving this unique place owing to the efforts of the Monviso Institute, which is led by Tobias Luthe. In 2015, Luthe explored the Torino valleys and identified Ostana as a perfect mountain retreat to establish a real-world laboratory of systemic design. Ostana has a unique Alpine landscape and has largely preserved its traditional Alpine style of stony wooden architecture and many conventional cultural practices. Thus, the revival efforts centred around the quality of its local architecture and landscape and leveraged local knowledge and traditions. However, local cultural traditions were declining and fading into oblivion because of its shrinking local population. Therefore, the most urgent issue was to attract more people to settle in the village and build their capacity to revive it. As a systemic design lab, the Monviso Institute coordinated most activities for reactivating the Ostana community and has taken the following localised actions (See Figure 3).

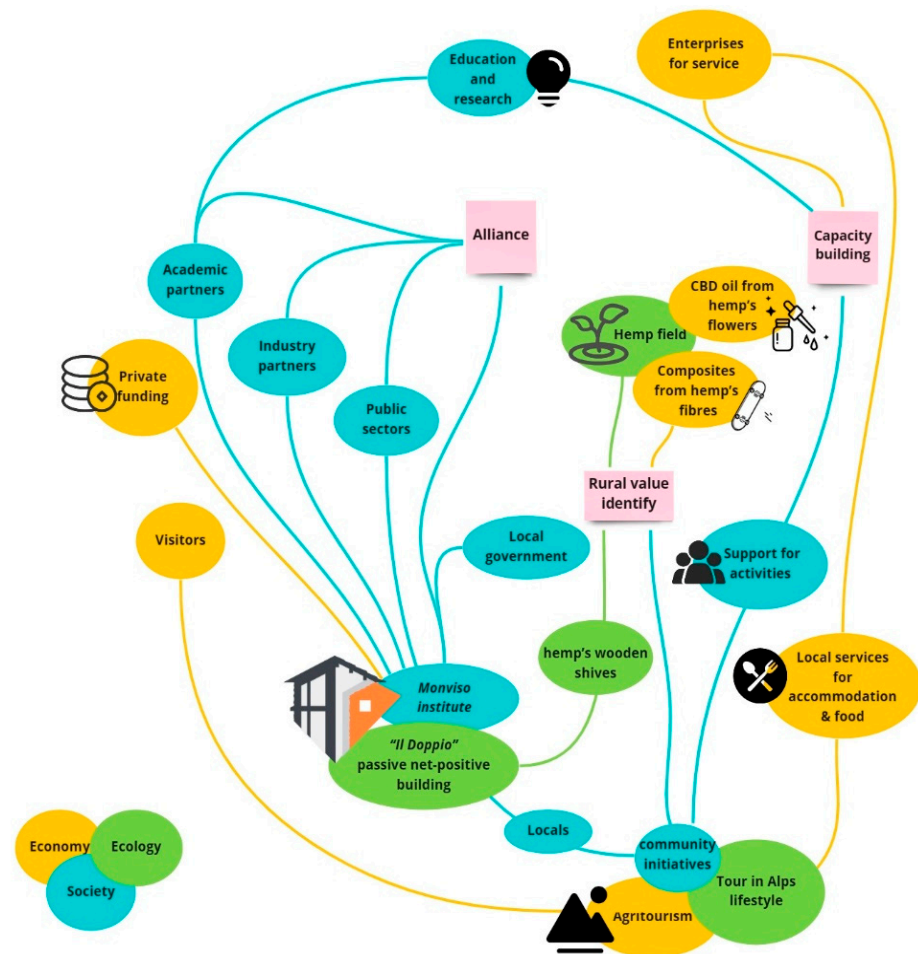


Figure 3. Systemic design lab for building a regenerative community.

1. Establishing a multifunctional alliance around the Monviso Institute:

Monviso Institute is privately owned and used as a real-world laboratory for research, education, entrepreneurship, and new living. It is connected with various actors from universities, social enterprises, and public-interest organisations. These entities have made a collaborative commitment to facilitate the sustainable transition and rural regeneration of the Ostana community at the intellectual, financial, and organisational levels.

2. Identifying the value of rural ecology, economy, and culture:

This involved reimagining the ecological future of the Alpine lifestyle by packaging Ostana as a recreational sanctuary for city dwellers rather than an abandoned countryside. The ecological and economic potential of traditional hemp plants was also redesigned. On the foundations of an abandoned traditional stony-wooden house, a passive net-positive wooden house, Il Doppio, was built. The Il Doppio exemplifies the practice of designing with nature and acts as a platform for facilitating dialogue between multiple partners. It reflects the inherent systemic nature of architectural design.

3. Building capacity for sustainability transition by relying on external support

The students from Politecnico di Torino designed a systemic map of the Ostana community; scholars from the Eidgenössische Technische Hochschule Zurich prototyped a systemic cycle for the community; a PhD candidate from the Oslo School of Architecture and Design designed a master plan that demonstrates sustainable construction and is embedded in the local ecological and cultural landscape. Moreover, other industrial and public partners, such as the Viso a Viso, Casa Salute, and Castelatsch, provided technical, managerial, and financial support to build the capacity of Ostana's ecosystem services.

Cooperation and dialogue among partners further facilitated the community's capacity by encouraging a multi-form learning process.

4. Reviving mountain livelihoods by developing outdoor tourism and partnerships with Ostana's craftspeople:

A series of pioneering community initiatives focused on revitalising Ostana's ecological and cultural resources by restoring its natural ecosystem were conducted. With the support of the local government and the Monviso Institute's efforts, these localised, culturally distinct activities have attracted an increasing number of urban tourists and helped establish a new Alpine-urban lifestyle.

5. Shaping a bio-regional circular economy based on traditionally grown plants, such as hemp:

Owing to hemp's multiple uses, hemp production has the potential to create a new circular mountain economy. Some of its potential uses include the production of laminated skis and other composites using hemp fibre, CBD oil production using hemp flowers, and the installation of building insulation using hemp wooden shives. Thus, after exploring the many uses of hemp, Luthé adopted a systemic design perspective to tap into the synergistic potential of multiple entry points within all the hemp-related sectors. Although the multiple functions of hemp have not been industrialised or marketed, its role in design research and nature education has been inspirational. Furthermore, these small, slow, yet diverse solutions interact with other actions, such as tourism development, capacity building, and the construction of passive net-positive buildings. From a systemic perspective, these activities have the potential to transform Ostana into a charming, resilient, and regenerative community that attracts urban visitors.

4.3. Common Grounds Based on the Situation-Cognition-Action Theoretical Framework

The two systemic design practices from China and Italy explored in this study have several common grounds based on the Situation-Cognition-Action framework (See Table 3). These common grounds answer the question of how systemic design facilitates sustainability transitions in rural communities.

Table 3. Comparative analysis of the two cases based on the analytical framework.

Framework	Common Grounds	Tieniu Village	Ostana Village
Deepen the understanding of complex situations.	Adopt a holistic, systemic lens. Focus on the leverage point.	Experience economy based on citrus oranges.	Agrotourism is based on the Alpine lifestyle.
Build cognitive capacity for addressing complexity.	System thinking for linking issues. Design thinking for iterating possibilities.	System thinking centred around the citrus orange industry. Designing a circular economy of citrus oranges.	System thinking centred around the resilient Alpine community. Designing a circular loop around hemp products.
Create a solution ecosystem through collaborative action.	Dialogue by establishing a co-creation platform. Building a social network for multidirectional learning.	Choumei Field Resorts Ltd., Chengdu, China Incubating professional-service institutions.	Il Doppio. Building an alliance for capacity-carrying.

1. Adopting a holistic, systemic lens and focusing on the leverage point to deepen the understanding of complex situations:

First, a systemic design helps deepen the understanding of complex situations through a holistic and systemic lens. In systemic design, leverage points are interfaces and entries for action that allow designers to easily take action on wicked problems at an early stage without being deterred by their complexity. The holistic lens considers the rural community as an organic system, whereas the systemic perspective penetrates the cause-and-effect relationships behind complex situations. Tieniu Village uses the experience economy as a leverage point, considering its ecology of citrus oranges and geographical advantages. Likewise, Ostana, which provides a spectacular view of Monte Viso, used agrotourism with the Alpine lifestyle as a leverage point. Furthermore, after finding suitable leverage points, practitioners can link the multiple values of rurality around these points to respond to the different demands for ecological protection, economic development, and social improvement under the Sustainable Development Goals.

2. Linking systems thinking with design thinking to develop cognitive capacity for addressing complexity:

A systemic design addresses designers' cognitive overload by integrating systems thinking and design thinking. It simultaneously takes advantage of systems thinking of linking various sub-issues and design thinking of iterating solutions. Systemic designers must step back from directly designing solutions and first reframe problems by linking sub-issues at several nested scales. Tieniu Village reframed the citrus orange industry in tandem with ecological agriculture, a low-carbon living experience, and the expansion of the citrus orange industrial chain. The Ostana community reframed its regenerative community by integrating with nature through building service capacity, experimenting with research centred on hemp, and blending cultural activities with local traditions. Eventually, the practitioners overseeing the sustainability transition for two villages iterated out a circular economy centred on citrus oranges and hemp, respectively, employing a designerly way.

3. Creating a solution ecosystem for collaborative action through co-creation and multi-directional learning processes:

Finally, the iterative characteristics of the systemic design are derived partly from gathering feedback from multiple parties and facilitating a multidirectional learning process among multiple actors. This also contributes toward creating a solution ecosystem. Therefore, public arenas are crucial physical spaces and dialogue platforms for establishing learning processes in multiple dimensions. In the two cases, there were both physical and virtual public arenas: for Tieniu Village, the experience hall and Choumei Field Resorts Ltd., Chengdu, China; for Ostana Community, the Il Doppio and a multifunctional alliance. More importantly, the interaction process among multiple stakeholders in these public arenas can trigger self-organisation and emergent behaviours in the rural system. In Tieniu Village, multiple stakeholders collaborate within the Choumei Field Resorts Ltd., Chengdu, China, through which professional service institutions take actions that are conducive to the solution ecosystem. In the Ostana Community, the construction of the public space named Il Doppio was used as an opportunity to draw in diverse actors who had the intellect and resources needed for the solution ecosystem.

5. Discussion

Why is systemic design applicable and suitable for different rural contexts? The two systemic design practices explored in this study from China and Italy revealed certain trade-offs. This section analyses these trade-offs and discusses how systemic design, as a world approach, addresses the different levels of complexity for completely different rural contexts.

5.1. Resource: A Combination of Inside-Out and Outside-In

Since the Industrial Revolution, with the advancement of urbanisation and industrialisation, the countryside has often been misconceived as an outdated concept that must be eliminated. However, current times urge us to move away from the traditional urban

dichotomy and treat the urban-rural as an organically integrated and complementary system. The resources used for sustainable rural development can come from both within and outside the rural subsystem, which is also true for sustainable urban development. In the broader urban-rural system, rural areas typically retain their local knowledge, cultural heritage, and ecological resources, whereas urban systems have abundant capital, technology, and management experience. In particular, the outside-in flow of external capital can connect and lever other factors for development. In return, the inside-out flow of rural value can continuously attract more capital and achieve a sustainable system. Thus, systemic design can recreate a resilient system that restores and grafts resources from rural and urban areas through a combination of inside-out and outside-in pathways.

In both Tieniu Village and the Ostana Community, systemic designers sought a leverage point to connect resources from urban and rural areas for rural transition. In Tieniu Village, with the local citrus orange industry as a lever, the economic and ecological value of agriculture was magnified. This attracted an inflow of urban capital and population. In Ostana, cultural activities, lifestyle, and construction, along with the Alpine Mountain tradition, acted as levers and unique resources inside-out to attract urban citizens, and the urban system brings in services, wisdom, and capital from outside the countryside.

5.2. Pathway: A Compromise between Top-Down and Bottom-Up Approaches

Different rural communities have their autonomous traditions with unique economic and societal foundations, and these act as challenges for design practices to achieve the rural transition. For villages with strong cultural traditions and autonomous structures, the locals may find it difficult to accept a direct and top-down approach to drive the rural transition. In contrast, in villages where a sense of community has been lost as a result of urbanisation, designers may find it extremely difficult to promote rural transition through a bottom-up niche innovation. However, most rural communities lie somewhere in between, and the systemic design enables designers to reconcile these contradictions.

The systemic design practices in both Tieniu Village and the Ostana community make such compromises to address wicked situations. Tieniu Village had a rich tradition of planting citrus oranges and a large population base, but it had a weak sense of community. In this situation, the demographic advantage could be activated through a top-down approach of instituting a rural cooperative, in turn facilitating bottom-up capacity building using endogenous resources for rural transition. Ostana had its cultural initiatives, such as rural festivals, dances, and choral songs, which allowed systemic designers to adopt bottom-up niche innovations with local people and external partners. However, owing to the private ownership of the land, before building the passive net-positive wooden house on an abandoned compound, a top-down initiative of purchasing the land was required by coordinating with the mayor.

5.3. Solution: A Solution Ecosystem for Community Renaissance

As stated previously, the sustainability transition of rural communities is an organic yet complex problem set that encompasses economic development, ecological protection, and societal prosperity. To effectively address these problems, it is crucial to provide rural communities with the requisite variety and to create a solution ecosystem rather than many solutions. Systemic design benefits from the integration of interdisciplinary methods and tools and can assist designers in strategising, using a holistic perspective, a targeted portfolio of actions for a rural community renaissance. Community renaissance refers to a series of actions that promote sustainable economic, ecological, and cultural transformations.

The solution ecosystem for community renaissance in both Tieniu Village and Ostana share some commonalities: both started with a multi-value identification of the rural economy, ecology, and society. Examples include the ecological and economic value of agricultural cultivation in Tieniu Village and the social and educational value of the rural culture in Ostana. Designers then considered the construction of management platforms

and public spaces to provide opportunities for creating a dialogue between multiple sectors. Tieniu Village set up a sharing platform, Choumei Field Resorts Ltd., Chengdu, China, for the co-creation and distribution of benefits, whereas Ostana built a public space called Il Doppio for experimenting and communicating with partners. Finally, the solution ecosystem pursued a circular economy, which is required to build a resilient rural community. Tieniu Village has explored circularity through its agriculture-based citrus orange industry, whereas Ostana created a bioregional economy around hemp.

6. Conclusions

Through a comparison of two systemic design practices in rural contexts in China and Italy, this study identifies common grounds based on the Situation-Cognition-Action framework. Rural communities, as organic systems, require a holistic, comprehensive, and systemic perspective to unravel and understand the complex, intricate relationships within their sustainability transition. Systemic design, as an integrated approach of systems science and design philosophy, aids in developing the cognitive capacity necessary to address designers' cognitive overload. Furthermore, systemic design is action-oriented, utilising co-creation and co-design processes to iterate a solution ecosystem for the targeted rural community. These common grounds not only provide insight into how systemic design enhances rural sustainability but also indirectly validate the theoretical framework constructed in this study.

Systemic design involves trade-offs to ensure its effectiveness across different rural contexts. Considering the wickedness of sustainable transition, and the complexity of system interactions, these trade-offs should be considered when implementing localised design practices in rural communities. First, systemic design is inclusive and open, emphasising the exchange of resources and values between urban and rural systems by leveraging the diverse value of rurality. Urban and rural systems are not mutually exclusive or competitive; instead, each possesses advantages in terms of resources and value within a larger planetary system. Second, systemic design is eclectic and compatible with top-down organisational intervention and bottom-up niche innovation. Sustainability transition is fundamentally a transformation issue of the social meso-regime, and only a transition mediated by multiple pathways can remain stable and sustainable. Finally, systemic design is strategic and primarily focuses on reshaping resilient rural ecosystems while considering rural public life as an axis of intervention. When addressing complex systemic issues, neither landscape design nor aesthetic education can holistically contribute to sustainability transition; rather, only an organic combination of architectural design, artistic empowerment, and community creation can effectively work.

Systemic-design scholars and practitioners recognise that there is no fixed paradigm for this approach and that it instead serves as a heuristic-guided general overarching approach of practice for designers. This study pioneered the Situation-Cognition-Action framework to analyse how systemic design facilitates rural sustainability. Then, it employed a comparative case study to illustrate how this heuristic framework can provide designers with managerial cognition to navigate through complex rural systems. Thus, the study contributes not only to sustainability research through empirical testing of systemic design for rural transition but also to systemic practice for sustainable rural development by providing some trade-offs for practitioners.

Owing to various constraints, this comparative study only includes two rural systemic practices. The framework of Situation-Cognition-Action is yet to be validated by more systemic design practices from diverse rural contexts, which is one of the directions for future research. More importantly, an in-depth analysis of the black box of the solution ecosystem of a community renaissance is required in future research.

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