



Smart villages in practice: A meta-synthesis of implementation experiences in Europe

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ABSTRACT

The concept of Smart Village, created by the European Commission in 2017, emerged as a response to the challenges faced by low-density territories, by promoting strategies based on local potential, opportunities, and digital technologies, using participatory approaches in their design. This study analyzes how the Smart Village concept has been implemented in European rural territories and what conclusions can be drawn about this strategy from the available empirical evidence. Based on inductive analysis and synthesis, this study seeks to understand how the initiatives were configured and which elements had influenced their implementation processes. To this end, 22 scientific articles retrieved from the Web of Science and Scopus databases were analyzed, along with 14 projects from the “Smart Rural Areas in the 21st Century” program. The main findings highlight the importance of involving multiple actors in the formulation and sustainability of the initiatives, the absence of instruments for monitoring strategies, and the challenges in implementing and adopting digital technologies. These findings contribute to understanding how projects and initiatives are configured, revealing operational gaps and asymmetries between declared objectives and the ways in which the initiatives have been designed and implemented in rural contexts.

1. Introduction

In 2021, rural areas in Europe were defined by diverse geography, natural environments, levels of development, and socio-economic profiles, were home to 93.1 million people, this is 20.8 % of the total population of the continent [1]. However, these areas face challenges, such as demographic aging, lack or absence of infrastructure, limited economic diversification, poverty, and social exclusion, factors that have contributed to the migration from rural to urban regions [2]. These pressures interact and can produce cumulative disadvantages, with consequences for quality of life and local resilience. Effective responses require development approaches that are place based, that consider context specific capacities and constraints, and that are oriented to longer term transitions rather than isolated projects.

Within this broader agenda, the Smart Villages approach has been promoted in European policy. Smart Villages refers to rural communities that seek to improve local services and well-being by mobilizing their own resources and knowledge, using digital tools as needed and within participatory and collaborative governance. The emphasis falls on tailoring and initiatives are co-designed with local actors, fitted to

existing practices and institutions, and adjusted over time through learning. In this sense, Smart Villages sits at the intersection of social innovation, digitalization, and territorial governance. A technology can play an enabling rather than determining role.

Although the concept has gained visibility, evidence on implementation is scattered across academic articles, project reports and program documents, making it difficult to understand how Smart Villages work in practice. As a result, practical questions remain about who takes central roles, how initiatives are configured and sustained, when digital tools add value, and how change is monitored.

This article addresses these gaps through a qualitative and inductive meta-synthesis of twenty-two peer reviewed studies and fourteen strategies or projects from the Smart Rural 21 portfolio. We integrate heterogeneous evidence to identify territorial framing, actors and governance, configuration of initiatives, digitalization and technology, and monitoring and indicators. Our synthesis examines how Smart Villages have been enacted rather than adjudicating a single definition. In our corpus, village denotes rural communities within OECD or Eurostat rural typologies. In practice, the unit of action ranges from a single settlement to a small municipality or to multi settlement areas, while the

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population size varies by context and is not a defining criterion on its own.

The article advances four contributions. First, it systematizes the role of participation and local knowledge. Initiatives that anchor digital tools in everyday practices and involve trusted intermediaries tend to be more durable. Second, it clarifies the function of digitalization. Technologies contribute when adapted to local capabilities and coupled with organizational routines, rather than introduced as technology push. Third, it documents gaps in monitoring and evaluation, including the scarcity of process indicators and the limited alignment between project level metrics and community priorities. Fourth, it distinguishes discursive smartness from substantive smartness, showing that adoption of labels does not necessarily translate into changes in service access or quality of life and outcomes depend on governance arrangements and capability building.

By approaching Smart Villages as an implementation process, understood as the set of practices through enabling communities to mobilize resources, experiment, and institutionalize change, this study offers an integrated lens to interpret heterogeneous experiences across Europe. The findings aim to inform the design, governance, and evaluation of rural development strategies in which digital tools are one component within place-based approaches.

2. Methods and materials

2.1. Meta synthesis

As Smart Villages are designed to address locally defined problems, outcomes are highly context-dependent and vary across cases, making quantitative aggregation impractical. Therefore, this study employs a qualitative, inductive meta-synthesis to integrate empirical evidence on Smart Village implementation in Europe, an approach that generates interpretative insights by comparing and integrating qualitative findings and identifying cross-cutting patterns within a small, heterogeneous evidence base [3].

2.2. Search strategy and data extraction

The search strategy focused on the Web of Science and Scopus databases and included, as gray literature, reports from the “Preparatory Action on Smart Rural Areas in the 21st Century (Smart Rural 21)” initiative. Texts in Portuguese, English, Spanish, and French published up to December 2024 were considered, using the descriptors “smart communit*” OR “smart specialization”; “smart village*” OR “smart rural*” OR “intelligent rural*” AND NOT “climate-smart.” The process followed PRISMA and used Rayyan.ai for duplicate management. The search returned 1271 records, of which 334 were removed as duplicates; 937 were screened by title and abstract, leaving 129 for full-text review. The final corpus comprised 22 scientific articles and 14 Smart Rural 21 projects, focusing on studies with evidence of implementation in European rural contexts

Selection was based on empirical research that demonstrates how initiatives and projects grounded in the Smart Village concept translate into concrete actions, excluding theoretical studies, policy overviews without implementation data, and macro-scale analyses disconnected from local practices. From the reading of the selected material, an inductive analysis was carried out that produced codes, subsequently grouped into categories capable of identifying aspects that enable the design and functioning of the strategies. On this basis, it was possible to establish five analytical axes: (i) territorial framing; (ii) actors and governance; (iii) configuration of initiatives; (iv) digitalization and technology components; and (v) monitoring mechanisms and indicators. From a methodological standpoint, we mobilized participatory approaches and knowledge co-production to examine governance arrangements, the role of local and codified knowledge, and the mechanisms that confer legitimacy and feasibility to the strategies. The

notion of social capital was used to interpret elements such as trust, reciprocity, and networks as conditions for coordination and cooperation. For the digitalization dimension, we adopted the perspective of innovation as a socio-technical process, that emphasizes adaptation, institutional mediation, and ongoing maintenance. Finally, we incorporated the debate on the smartness discourse and the use of the “smart” label, distinguishing rhetoric from substantive transformations and the tensions between digitalization and services, on the one hand, and social innovation and community action, on the other. Taken together, these theoretical approaches supported the interpretation across the five analytical axes adopted.

3. Theoretical framework

3.1. Smartness and smart villages

The Smart Villages (SV) concept emerges as a result of changes that have taken place in rural economies, that are increasingly less dependent on agriculture for their functioning [4], and of the policy shifts proposed by the OECD [5] through the New Rural Paradigm, a policy framework that moves rural policies, formerly composed of sectoral, subsidy-based approaches, toward territorial and integrated approaches tailored to local specificities, since each rural territory displays distinct capacities and responses to challenges [4].

In 2017, the Cork 2.0 Action Plan introduced the Smart Village concept and established the foundations and institutional elements of this agenda through the “EU Action for Smart Villages.” Based on this framing, Smart Villages can be defined as communities or rural areas that proactively build on their existing strengths and resources to improve quality of life and local services [6–9]. According to this concept, such improvement rests on digital mobilization, social innovation, efficient resource use, and the integration of technology into everyday life through participatory strategies. In this paper, “village” denotes rural communities identified through OECD and Eurostat territorial typologies rather than a fixed population threshold, in line with European policy instruments” [10].

Although the Smart Village concept is defined across different documents, it lacks a binding legal definition in the European Union [1]. Nevertheless, there is a programmatic legal framework in instruments such as Regulation (EU) 2021/2115, that provides for the preparation and implementation of Smart Village strategies, and Regulation (EU) 2021/1060, that lays down the common provisions for European Funds and defines the functioning of Community-Led Local Development (CLLD), whose rural strand, the LEADER programme, can be used as an instrument for implementing Smart Village strategies [8]. This makes Smart Villages a public policy concept that is supported by several instruments but lacks its own legal definition. The absence of specific legal instruments is repeated in most EU Member States, with the exception of countries such as Poland or the Czech Republic, which have programmatic documents or guidance instruments for implementing projects of this kind, whereas Romania has specific legislation on the use of funds for interventions based on the Smart Village concept, provided for in Government Emergency Ordinance No. 156/2020 [11].

Smart Villages should not be understood as rural versions of Smart Cities. Smart Cities are systemic, data-driven urban approaches that use digital technologies to integrate and improve mobility, energy, environment, social services, and other functions, with the participation of public, private, and civil society actors and an orientation toward sustainability [12,13]. By contrast, the Smart Villages approach focuses on mobilizing local resources, territorially embedded knowledge, and community engagement for improving quality of life and reduce inequalities [14]. In this sense, smartness can be defined as the capacity of rural communities to identify and respond to their own challenges with contextual and sustainable solutions. In 2019, an operational definition of SV was proposed based on four elements: (1) identification of local needs and resources; (2) territorial embeddedness of solutions; (3)

integration of digital and social innovation, empowerment, and training; and (4) cooperation among community members, associations, and local authorities.

To transform a community into a smart one, it is necessary to design an innovative strategy, concept, or development plan. However, innovation can be a variable concept, once a mechanism can be qualified as innovative in some contexts, and not innovative in others, thus, the definition of a smart community is contextual [10]. Although strategies should be tailored to the characteristics of each community, some elements are found in SV development plans. These include the creation of a shared community vision and the utilization of existing local ideas and projects. Such strategies can enable the implementation of medium and long-term initiatives, serving as tools for communicating the village's vision to community members, encouraging their participation, and to external stakeholders, such as regional and national bodies [10]. Continuous stakeholder involvement is desirable for implementation, management and monitoring of strategies over time. The success of these initiatives depends on the level of engagement from local actors and leaders, as well as the networks they possess or can establish [4,6]. For this reason, communities facing challenges such as depopulation or a lack of leadership can struggle to implement or even initiate planning processes [4,9]. There is no single formula for stakeholders' involvement; each context requires analysis and adaptation to local realities. Still, evidence from implemented SV projects shows that higher success rates are associated with local ownership, recognition of volunteer contributions, and institutional support that values community-led ideas [10]. Once there is no universal model for stakeholder involvement, tailoring approaches to local dynamics remains necessary.

This study adopts a pragmatic stance toward the SV concept. Rather than assessing its definitional boundaries, it examines how the concept is interpreted and operationalized across rural contexts. This includes both the concrete strategies employed and the political-symbolic uses of the "smart" label, which can sometimes reflect alignment with policy agendas more than substantive transformation [15]. The following sections develop a framework to understand Smart Villages as implementation processes shaped by local participation, technological integration, and contextual adaptation.

3.2. Participatory approaches and knowledge

Participation can play an important role in the practical implementation of Smart Village initiatives. The SV approach promotes decentralized governance, favoring bottom-up strategies that actively involve local actors identifying challenges, mapping territorial resources, and constructing long-term visions. In contrast to centralized models common to national or international institutions, Smart Villages depends on regional and local engagement, which can include transfer of responsibilities to municipalities, associations, cooperatives, and civil society organizations. Involvement in planning processes can strengthen trust between community members and public institutions, as well as foster awareness of shared problems and the potential for collective solutions [16]. This participatory dynamic depends on the availability of formal spaces for engagement and the capacity of communities to organize and mobilize different types of knowledge. Literature on rural development points that successful implementation can involve the integration of diverse forms of knowledge and experience, including codified, tacit, local, scientific, administrative, and experiential knowledge, each contributing in specific ways depending on the context [17, 18]. Expertise, in this framework, can be defined by credentials or formal roles, the position of individuals within social and institutional networks and the knowledge application to shape decision-making processes. Local knowledge, sometimes referred to as practical or situated knowledge, emerges from lived experience and informal learning in specific cultural and environmental contexts [17,18]. Although it could not hold formal recognition, this type of knowledge can facilitate assess the feasibility and acceptability of proposed strategies. It can also inform

both the technical aspects, such as farming methods adapted to local climatic conditions, and social dynamics, including norms of cooperation, informal leadership, and conflict resolution. Thus, incorporating local knowledge into planning processes contributes to more appropriate and credible interventions [19,20].

Different forms of knowledge can contribute to the implementation of Smart Villages. Scientific knowledge is associated with structured research, peer evaluation, and formal dissemination and it includes academic production and institutionalized forms of transmission, such as classroom education or apprenticeship models [17,18]. Although this type of knowledge tends to carry more legitimacy in policy and technical environments, it can only represent part of the knowledge used by communities to make decisions. Other forms of knowledge, such as that developed through public administration or service provision, are based on practice and oriented toward operational goals. This includes procedural knowledge, regulatory frameworks, and decision-making routines used by local authorities or development agencies [17].

Finally, communities can also use the local or tacit knowledge, typically informal, based on lived experience social and environmental contexts. It tends to be developed through daily routines and transmitted through habit, imitation, or oral tradition. This kind of knowledge can be used for understanding the function of certain local practices, including techniques adapted to environmental conditions or organizing cooperation and support ways [17,18].

Knowledge shared by local or external actors can contribute to building community capacity and strengthening social capital. One way this occurs is through the development or territorial identity redefinition supported by actors such as local authorities, development agencies, associations, or cooperatives [19]. The definition or redefinition of territorial identity serves two main purposes. First, it has a function as a marker of cohesion by reinforcing shared practices, cultural symbols, and local narratives can define a sense of place. This cultural and social capital can support the formation of networks and facilitate access to external resources. The second purpose is related to territorial identity as a tool for encouraging local actors to recognize and use cultural elements as assets in development strategies, whether for institutional collaboration, visibility, or economic initiatives [19]. The implementation of SV initiatives thus depends on aspects related to infrastructure, technical resources and the ability to integrate different forms of knowledge into planning and decision-making processes. Active community participation and the recognition of knowledge can strengthen the legitimacy of strategies and their viability, as well as building territorial identities that can boost sustainable development in rural areas.

3.3. Social capital and cooperation

The concept of social capital can be useful for understanding the factors influencing cooperation and governance in rural contexts. Social capital can be associated with elements such as trust, reciprocity, and access to networks that support cooperation, but there is no consensus on its definition. For Coleman [21], social capital is embedded in social structures that can enable the exchange of information and resources. Putnam [22] associates it with networks and norms that support coordination, while for Bourdieu [23], describes it as access to resources through social connections and the position within institutionalized relationships. Despite their differences, these definitions share the idea that social capital links individuals and groups to collective assets through socially mediated relationships [24]. In rural areas, these relationships can be longstanding and informal, or they can be developed through efforts to promote cooperation among different groups. The trust between different individuals or groups can emerge from shared history, daily interactions, or institutional mechanisms such as community meetings and local associations. In contexts with strong ties, coordination tends to be smoother, especially in the implementation of community-based projects. However, new actors can face difficulties related to accessing spaces of decision-making, reducing the diversity of

ideas and limiting the adaptability of Smart Village initiatives [20].

Cooperation, understood as a product of social capital, can be built through negotiation processes involving shared interests, mutual assistance, and the distribution of responsibilities. These processes can occur formally, through local councils, cooperatives, or associations, or informally, through daily arrangements and social expectations [20,22]. Localities with higher levels of self-governance capacity are understood as better positioned to sustain cooperation over time, but this capacity can also be supported by intermediary actors, such as development agencies or technical advisors. Cooperation, as a dimension of social capital, can emerge through negotiation processes based in shared interests [20,22]. These processes can be formal, such as those occurring within associations or public councils, or informal, shaped by habitual practices of mutual assistance, participation, and responsibility sharing. The presence of these dynamics tends to increase the chances of coordinated action. Rivera et al. [20] note that localities with higher level of self-governance are more likely to foster internal cooperation. In contexts which autonomy is limited, this role can be partially assumed by intermediary structures like associations and development groups that facilitate dialogue. However, participation in formal networks can be denied by the actors, e.g., rural producers may hesitate to engage with cooperatives due to concerns over losing control of their operations, which in turn it can limit the potential for collaboration, joint investment, or even exchange ideas.

Cultural and traditional elements can also influence how social capital takes shape, once it can reinforce the sense of belonging and continuity, supporting local cohesion. In some territories, specific products, crafts, or events carry symbolic value and contribute to the community's external identity. The recognition beyond the local scale can have economic functions, such as attracting visitors or promoting regionally branded goods [20,24]. These dynamics illustrate the cultural practices as expressions of identity and can also support coordination and generate new opportunities for development. For the Smart Villages, social capital plays a dual role. It can enable the organization of local initiatives, improve the legitimacy of decision-making, and enhance cooperation across sectors. Improper management, however, can reinforce existing inequalities or prevent wider participation. Recognizing the different forms and functions of social capital, and their effects on local governance, can clarify the reasons of some communities are more successful than others in implementing inclusive, adaptive, and sustainable strategies.

3.4. Innovation as integrated social and technological process

Innovation in the context of Smart Village strategies can involve both technological and social components. Studies demonstrate that, in rural territories, the application of digital tools can present better results if they are combined with local organizational practices and community engagement [25,26]. In such cases, innovation is formed by processes of co-construction, appropriation, and adaptation to specific territorial conditions. The practical use of platforms, digital devices, and service systems depends on the integration of these tools into daily life of the community. Initiatives involving residents in the design and implementation of technological solutions can present more consistent outcomes. Müller et al. [27] demonstrate cases in which relatively simple technologies, such as digital noticeboards or remote monitoring tools, had contributed to service provision and local coordination.

The introduction of new tools is supported by social processes that enable learning, experimentation, and interaction. According to Sept [26], shared trajectories and mutual trust are components that can facilitate the use of technology in rural regions. Philip and Williams [25] argue that initiatives disconnected from local institutional and social dynamics can present difficulties related to effectiveness and lower potential for its continuity. Technological implementation and use can be facilitated through the participation of institutional mediators, such as municipal staff, digital facilitators, or community organizations. These

local actors possess local knowledge about the local practices and needs, and it can be used to promote the process of aligning these tools to the territory. According to Hanninger et al. [28], the practical innovation relevance depends less on the complexity of technological infrastructure and more on adaptation and maintenance of tools over time. The availability of local knowledge, social networks, and institutional support are important in this process.

This approach to innovation recognizes that technical interventions are shaped by operating institutional environment. Factors such as social capital, local leadership, governance structures, and access to support networks influence both the design and outcome of Smart Village initiatives. Instead of treating innovation as a standardized input, this perspective sees it as a dynamic and relational process, embedded in the place to evolving local conditions.

3.5. The smartness discourse

The use of the "smart" label across policy, funding, and development narratives has raised questions about the meaning and function of this terminology. While the Smart Village framework is associated with community-led innovation and technological inclusion, the conceptual elasticity of smartness is a broad concept that has not yet acquired a settled or consensual meaning. This ambiguity allows the instrumental use of the label, shaped more by external policy trends than by locally grounded strategies.

Vanolo [15] refers to this phenomenon as smart-mentality, a mode of discursive governance in which the smart label operates as a normative expectation and descriptor of actual transformation. In this view, territories are encouraged, implicitly or explicitly, to align with dominant narratives centered on innovation, digitalization, and competitiveness. This alignment privileges certain types of knowledge and interventions and marginalizes others that are embedded in local practices. Lara et al. [29] question the reduction of smartness to a set of measurable technological inputs, calling instead for a human-centered approach. In rural contexts, the infrastructural, demographic, and institutional realities differ from urban settings, it can produce superficial compliance instead of meaningful transformations.

According to Slee [30] there are two discourses within the Smart Village agenda, the first one is grounded in digitalization and service delivery, and the latter is rooted in social innovation and community agency, thus, these discourses reflect tensions related to the purpose and direction of rural development strategies. Digital tools can contribute to efficiency and connectivity, but their introduction does not necessarily lead to inclusive or contextually appropriate outcomes. In some cases, the smart label prints a signal of eligibility for funding or alignment with policy rhetoric than describing community-led processes. Recognizing these tensions does not imply dismissing the Smart Village framework. Rather, it points to the need for critical engagement with how concepts are translated into practice. The use of the smart label can create opportunities and visibility, but it can also limit expectations and direct attention toward specific types of solutions. A discursive reading of Smart Villages focusing on language, legitimacy, and policy framing interacting, can clarify the gap between institutional narratives and the diverse realities of rural territories.

4. Results

4.1. Governance and actors

The analyzed cases revealed the involvement of actors in the creation and implementation of strategies and initiatives, including those from the private sector, public sector, and civil society. Local government representatives were responsible for establishing connections with external actors, establishing partnerships and protocols with other levels of government, associations, and NGOs ([31]; Babida [32]). However, the ability of local governments to engage with their communities

depended on the nature of existing relationships between the government and community members. In cases where trust and cooperation had already been established, collaboration was more successful ([31]; Babida [32]). Battino and Lampreu [33] report that a municipal initiative, in cooperation with a private entity, sought to train residents for tourism-related activities and boost local tourism through social eating. The project involved one year of training and resulted in 15 professional profiles with new skills, especially in ICT, and also enhancing the attractiveness and visibility of the territory for tourists. However, community participation remains uneven, possibly linked to local political divergences and to the limited habit of conceiving hospitality as a source of income, and there are structural constraints, such as the lack of accommodation.

Associations and cooperatives played roles in two main areas, first, in activities related to the creation, monitoring, and evaluation of initiatives [34,35]; and second, in stimulating entrepreneurship, including the establishment of community stores or the promotion of local products [36]. Educational institutions, such as universities and polytechnic institutes, contributed by categorizing and translating local or territorial knowledge for other actors within the ecosystem [27,32,37,38], these institutions utilized tools like the Territory Game, Living Lab, or World Café. In contrast, cases without their involvement relied on methods such as interviews, questionnaires, and formal or informal conversations [25,26,28,38–40].

The involvement of the local community in these activities varied, in some instances, the community adopted a proactive role, designing, developing, and implementing the project itself [35,41,42]. In others, the community took a passive role, being consulted by other stakeholders involved in the project. Another aspect was the community's adherence to the project, which influenced the outcomes of the initiatives. The community can initially resist adopting changes; even if there is interest in the proposed adjustments, altering practices and habits often requires long-term adaptations [27,43]. This process depends on mobilizing resources for learning, and the sustained commitment of stakeholders to ensure active participation in the project. Initiatives involving a diverse range of actors in the development of solutions have yielded more nuanced and effective outcomes. For instance, Mukarov's initiative [44] and Komorowski's studies [34] demonstrate that urban residents can contribute innovative ideas to rural areas by introducing new needs and lifestyles, thereby enriching and diversifying local dynamics.

The exchange of information and the participation of diverse community members resulted, through co-design processes, in an electronic display installed in a village shop in the Rhineland, Germany, designed to disseminate information of public interest. Over approximately two years, 24 workshops were held with local residents, serving as spaces for negotiating interests, defining boundaries for data use, and providing digital literacy for older adults. To broaden participation, the workshops were scheduled at different times for three groups. The process yielded an exploratory prototype installed on site, with widgets such as news, weather, calendar, offers, photos, and a quiz produced by older adults, which was used to observe use in real contexts and to inform subsequent steps [27]. This case shows that routines of cooperation, joint production, and mediation between groups can strengthen existing local networks and the level of trust necessary for local coordination.

Another initiative [28] was enabled through the articulation between the municipal council, a local facilitator, and scientific advisory support, these actors formed working groups that served as arenas for co-decision. Decisions taken at the local level led to the creation of solutions that were plausible for the community, but legal barriers would have prevented their implementation. Owing to existing institutional linkages between local and state levels, these legal issues were resolved through authorization by state authorities, thereby underscoring the importance of contact networks for the success of projects carried out in low-density communities.

In synthesis, the development of smart rural territories relies on

human capital, mobilized networks, and the interest of both actors and the community in implementing and sustaining projects within the territory. While local innovation is valuable, the inclusion of external actors and diverse stakeholders enriches strategies and enhances adaptability. The success of Smart Village initiatives can rely on developing trust, cooperation, and participatory methodologies, ensuring community adherence and a sense of ownership. Collaboration among local and external actors, alongside the effective use of networks and cultural elements, are desirable for responding challenges.

4.2. Initiatives configuration

European SV initiatives reflect efforts to resolve local challenges (Appendix C). However, the implementation and management of these solutions require the continuous participation of actors throughout the processes. In rural areas, the population densities are low, and the involvement of community members is important for sustaining projects. To encourage engagement, public events have been employed as a means of connecting the community with SV initiatives. These events have as purposes the disseminating of the project objectives, raising awareness among community members and other stakeholders, and providing an official platform to validate the project's legitimacy within the community [28,45]. Maintaining actor involvement in subsequent stages can be facilitated by ensuring transparency throughout all phases of the project ([28,45]; Babina [32]). Transparency and visibility allow stakeholders to remain actively engaged with the initiative, stimulate improvements in ideas, methods, and the alignment of solutions with the local context. Social networks and messaging applications have also been identified as tools for publicizing projects, scheduling sessions, and facilitating communication among participants ([39,42,45]; Babina [32,40]). Despite these facilitators, coordinating participants can be challenging, particularly given the age demographics of rural communities. In Poland [34], a local association carried out micro-interventions translated into drainage solutions and community equipment, financed by a portfolio of funds combining national environmental funds with private donations and LEADER/FEADER funds. These initiatives followed a phased implementation methodology with results visible to the community. This contributed to sustaining community participation and aligning the pace of implementation with community capacities, thereby facilitating local appropriation and the coordination of both resources and actors.

Müeller et al. [27] points that scheduling conflicts can discourage participation, requiring sessions at different times to accommodate various groups within the community. Monitoring the initiative is another challenge. Among the analyzed studies, only one article explicitly mentions project monitoring [28], and of the projects reviewed, only one lacks any reference to actors or methods for this phase [39]. Monitoring strategies are conducted by teams composed of community agents [40,45], public or private agents and institutions [37,39,46,47], or collaborative teams that combine community agents with public or private entities [40,48,49]. However, albeit identifying the actors responsible for this phase, few projects specify the instruments and indicators used for monitoring (Appendices A and B). This points to the need for further studies to develop tools that facilitate the identification and creation of effective monitoring mechanisms. In this regard, the importance of local governments being equipped with monitoring frameworks tailored to rural territories, once governance complexity can exceed available institutional capacity. In synthesis, the implementation of Smart Village initiatives relies on the involvement of local communities, the public participation is important for the projects maintaining, especially in low-density rural areas. Transparency throughout all phases of the strategy, combined with the use of public events aimed the community engagement and awareness. Public events not only disseminate project objectives but also validate the initiative's official status, reinforcing trust and collaboration among stakeholders. Monitoring initiatives is another area that deserves attention, with

limited studies and projects specifying the actors, methods, or indicators required for this stage. The absence of standardized tools points the need for further research to develop adaptable monitoring instruments tailored to the contextual nature of Smart Village strategies.

4.3. Digitization and technology

Studies on the implementation of information and communication technologies (ICT) and other digital tools in rural areas [25,26,28] points challenges associated with the adoption and use of these technologies. The selection of technological solutions should consider two primary factors, the community's capacity to maintain the technology and the need to raise awareness and educate residents about its use. On one hand, the technologies must align with the community's ability to install and ensure the functioning of digital infrastructure. The adoption of technology involves a combination of different factors, such as technical training, stakeholders' education, the development of new structures and mentalities to manage and use these tools [25,28]. Resistance to adopting new technologies is another obstacle [43,50], in special with ageing rural populations, which a smaller proportion of citizens actively engage with digital solutions [28]. Entrepreneurial aspects related to opening new companies or businesses that require the adoption of technology can accelerate the use of technology by local population [50]. Digital literacy can be developed through traditional training courses; however, Phillip and Williams [25] suggest that forums or community events focused on specific technologies, such as iPad clubs where elderly participants gather with their devices, can also promote digital skills. These gatherings have been shown to reduce dependence on family members or neighbors. Additionally, older adults living with children or teenagers tend to develop digital literacy more quickly than those without younger family members, a factor that warrants attention in areas experiencing extreme depopulation.

The materialization of projects focused on the use of digital technologies could be observed through the implementation of digital platforms for local services, mobility, and communication in pilot municipalities in Germany [26,28,51]. In Bavaria, with state funding, public services were structured through co-creation with local groups, resulting in the replacement of paper bulletin boards with five digital panels, with the aim of using low-cost solutions. The digital panels operate with tools such as analytics, which enable tracking and monitoring of user access and allow for better adjustment of content and scheduling. The same initiative also developed one application to inform and communicate with the local community, and another intended to serve as a communication channel between teachers and families [28]. Other initiatives led to the creation of a mobile application that allows residents to switch on public lighting on demand, a direct response to the darkness some residents faced after the automatic switch-off of lights. Additionally, to enable the installation of communication infrastructure, a model was created that allows residents themselves to facilitate the installation of fibre-optic lines by high-speed internet operators [26]. Another initiative concerned the setup and use of a shared electric car via a reservation app with district funding. To ensure residents could use the vehicle properly, a digital literacy course was offered for adult education, with the applications introduced to users before the service launch [51].

Despite the use of financial resources, projects may face limitations due to the lack of dedicated funds for digital literacy initiatives within SV projects. Communities with limited financial resources are unable to invest in the necessary equipment and infrastructure, relying instead on public and private funding sources. Unlike programs such as LEADER, SV initiatives do not include specific funding allocations for these activities [10]. In Germany digital innovation initiatives had stressed participatory design and adaptation to local needs [26,52]. In these cases, communities collaborated with facilitators to co-create tools for communication, coordination, and access to services, the main focus is not on which technology is more advanced, but on developing digital

solutions that correspond to local priorities and daily routines. However, technology has also proved to be a tool for strengthening local identity. Local public administrators have developed activities to attract tourists and visitors to the area by promoting local product fairs, festivals and cultural and sporting events online [53].

In synthesis, the implementation of technologies in rural areas depends on each community's financial capacity to acquire and maintain services or equipment, which can delay or even hinder the adoption of digital solutions. For successful integration, it is also necessary to align technological solutions with the community's infrastructure and capacity to adapt traditional processes to digital formats. Adoption by the territory and its residents can be facilitated if the practical benefits of digital technologies in daily life are effectively communicated to potential users. However, limited financial resources and the lack of dedicated funding for digital literacy and infrastructure demand communities to seek external funding. Sustainable adoption of digital technologies depends on strategies that integrate education, funding, and active community involvement.

5. Discussion

Smart Village initiatives have been presented in both academic literature and European public policy as a potential response to the socio-economic, demographic, and digital challenges affecting rural territories [8,54]. This approach is based on the combination of participatory governance, the valorization of local resources aimed at promoting sustainable development, and the use of digital tools suited to the local context. However, achieving results through this configuration requires the coordination of different elements, such as the mobilization and involvement of local actors throughout different stages of the process, including the design, implementation, development, and monitoring of the initiatives.

Community involvement in these initiatives can enhance the legitimacy and adaptability of projects to the local reality, moreover, it can foster social cohesion, reinforce local identity, and facilitate the translation and circulation of knowledges [34,52]. However, in small and ageing communities, the translation and adaptation of ideas can take long periods and require specific capacities among the population, such as digital literacy, service design, and mediation. This implies the need to maintain engagement throughout the stages, that is, to shape factors such as trust, reciprocity, and cooperation networks. On the other hand, when engagement can be sustained, it can also generate challenges that affect the progression of projects, such as conflicts, delays, or decision-making overload, particularly in areas with limited human capital or aging populations [25,27]. Although SV projects and initiatives are regarded as being undertaken by proactive communities [9], in practice such initiatives are initiated and led by politico-administrative actors subject to term cycles, without the institutionalization of these strategies, the risks of discontinuity increase after changes in office.

The promotion and use of ICTs in structurally or culturally peripheral areas may face resistance, either due to fears that local habits or cultural aspects could be altered by these technologies, or because of a lack of understanding of their functions in daily life. This lack of understanding may be linked to low levels of digital literacy [43,55] or inadequate translation of technical knowledge to potential users. Resistance to new technologies or low digital literacy has been addressed through accessible community events and support spaces, serving as capacity-building platforms and as forums for knowledge exchange. These spaces can foster participatory and context-adapted digitalization processes [25, 26], moreover, support from technical intermediaries can accelerate the community's learning curve.

With regard to funding, the flexibility of Smart Village models contrasts with more structured programs such as LEADER or CLLD. The absence of predefined funding mechanisms can make it difficult to access resources, but on the other hand it can be an opportunity for experimentation and partnerships in line with local conditions. Pilot

initiatives with hybrid funding sources demonstrate that the model can operate in diverse institutional settings, potentially generating benefits for communities such as adaptive territorial flexibility, local ownership of processes, and the development of resilience mechanisms in the face of fragmented or absent policies [54]. This study identified the absence of formal implementation and monitoring instruments in several initiatives. This gap affects a range of aspects, such as management and learning through initiative cycles, as well as the evaluation of the Smart Village concept itself in the European context. The lack of technical and organizational capacities to configure and operate these monitoring systems may also be indicative of difficulties in the articulation and coordination of resources and actors.

This study contributes to the debate on Smart Villages by synthesizing empirical studies and examining operational dimensions. The findings indicate that effective implementation depends on sustained multi-actor engagement and the mobilization of place-specific capacities to devise context-appropriate solutions. These requirements are demanding in territories with limited human capital and become even more challenging when proposed solutions require community capacity for building their proper use. Regarding governance, although proactive communities are emphasized, in practice a share of initiatives are led by political actors [28,34,51] subject to electoral cycles, which jeopardizes continuity when initiatives are not institutionalized.

6. Conclusion

This meta-synthesis seeks to understand, based on the available empirical evidence, how Smart Village initiatives have been implemented in European rural territories and what implications they have for the development of the concept.

Initiatives grounded in this concept show that public participation and community engagement are necessary for its realization. However, achieving this requires community synergies and the presence of formal leadership, such as politic actors, as well as informal local leaders. Based on our analysis, in rural contexts informal leaders can play an important role vis-à-vis formal political leaders, since the latter are constrained by administrative structures and term limits. This matters because SV projects may require years, or even decades, for effective implementation.

Because it is a concept grounded in each territory's potential and capacity to respond to the problems that affect it, Smart Villages may take the form of projects of different natures and scales. On the one hand, this is advantageous for communities in these territories, as it enables the development of tailored and flexible solutions; on the other hand, the freedom to choose themes and how to address them can become problematic if objectives are not properly formulated and if the necessary resources and actors are not mobilized. Our analysis of the studies shows that mobilizing these components is challenging for communities, which must appeal to the participation of higher-level agents and institutions, such as regional, state, or even national administrations. In addition to actors with greater capacity for network mobilization, initiatives may require technical or educational components that can facilitate the adaptation of the initiatives or promote training, either in different modes of practice or, in the case of technology-related projects, in the use of technologies.

The use of technology is encouraged by the concept, insofar as it is grounded in the Cork 2.0 Declaration; however, for this to occur in rural settings, some aspects must be considered. First, for technology to be effective and efficient, it must address problem-solving needs related to a previously identified issue; second, it is necessary to promote changes in mindset and embed technology in the community's everyday life. These two aspects indicate that the community will primarily require adequate infrastructure for implementation. This translates into the need for high-speed internet networks and sufficient energy capacity to meet demand, and territories lacking basic infrastructure may take considerable time to satisfy these requirements. Even if this aspect is

overcome, populations in rural communities tend to be older than those in urban centres, a factor that may affect the implementation timeline. In contexts where both situations occur, namely, absence of infrastructure and resistance among residents, the effective use of technology may take decades to materialize properly, resulting in a lengthy process that will require centrality, coordination, and persistence from the actors involved. On the other hand, project implementation can yield positive outcomes for the territory. As observed, using public events as project kick-off milestones and maintaining transparency throughout the project phases translate into greater community engagement and can help prevent issues related to corruption or the diversion of funds to other purposes. Engagement may also strengthen support and contact networks among people in the territory, thereby increasing local social cohesion.

Funding for projects of this nature also proved flexible, both public and private sources can be used, reinforcing the model's open nature, this feature enables experimentation and partnerships aligned with local conditions. Conversely, funding may come with requirements such as implementation and performance indicators. With respect to measurement capacity, an absence of indicators was identified in several of the projects studied. This points to a failure to formulate metrics capable of verifying the effectiveness of the proposed solutions at the micro level, the same absence has hindered, and continues to hinder, the assessment of these initiatives' success at the European level. It is important to acknowledge that there may be results not captured in this meta-synthesis—for example, some outputs from Smart Rural 21 projects remain undocumented or unpublished, and this lag between implementation and reporting constrains evaluation. Beyond this, this qualitative meta-synthesis has limitations that shape how the findings should be read. First, most primary sources describe activities and short-term outputs, outcome data and longitudinal evidence are limited, constraining what can be inferred over time. Second, the evidence base combines peer-reviewed studies with institutional project material, which may favour better-documented examples, information on maintenance and less successful attempts is scarce. Finally, follow-up periods are generally short and distributional effects within communities are occasionally examined, leaving open questions on sustainability and equity.

In conclusion, the Smart Village concept emerges as a means to improve local infrastructure and quality of life through locally designed strategies and synergies that may involve actors from different spheres and institutions, thereby making communities responsible for shaping and steering their own future. In this regard, it can be understood, in part, as a transfer of powers and responsibilities from the State to the communities themselves. As observed, the concept has materialized through small-scale initiatives aimed at upgrading local infrastructure, expanding connectivity, improving services, and attracting people to the territory. Nevertheless, implementation has been slow, particularly in digitalization projects that require digital literacy. Finally, the concept appears more accessible to actors with greater capacity for mobilization and organization than to populations facing significant needs and requiring effective interventions capable of improving local quality of life.

With regard to future studies, it is recommended to develop co-designed, indicator-based longitudinal evaluation frameworks, particularly in communities that have moved beyond the pilot phase. In addition, more in-depth studies are needed on the incorporation of the concept into local and national regulations, given the absence of a legal framework at the European level.

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CRedit authorship contribution statement

Lucas Dembogurski: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lívia Madureira:** Validation, Supervision. **Ricardo Bento:** Validation. **Aida Carvalho:** Validation.

Declaration of competing interest

We confirm that this manuscript is original, has not been published

elsewhere, and is not under consideration by any other publication. Additionally, all authors have approved this submission and have no conflicts of interest to declare.

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Appendix A. Description of articles analyzed

Author	Title	Year	Country
Hanninger L., Laxa J., Ahrens D.	A roadmap to becoming a smart village - experiences from living labs in rural Bavaria	2021	Germany
Soulard C., Lardon S.	Action-Research Helps Researchers Foster Smart Rural Development: Two Case Studies on Local Food Policy	2019	France
Gonçalves A., Filippi M., Galliano D., Triboulet P.	Business strategies for smart rural development: The renewal of territorialized productions	2021	France
Soligno R., Scorza F., Amato F., Casas G., Murgante B.	Citizens participation in improving rural communities quality of life	2015	Italy
Phillip L., Williams F.	Healthy Ageing in Smart Villages? Observations from the Field	2019	Scotland
Müller C., Struzek D., Jung-Henrich J.	Participatory design in the smart village: Co-design of a public display in a rural village shop	2018	Germany
Ogrzyzek M., Krupowicz W., Sajnóg N.	Public participation as a tool for solving socio-spatial conflicts of smart cities and smart villages in the sustainable transport system	2021	Poland
Komorowski L.	Smart Initiatives in a Suburban Community: An Example From the Holy Cross Mountains in Poland	2022	Poland
Battino S., Lampreu S.	The role of the sharing economy for a sustainable and innovative development of rural areas: A case study in Sardinia (Italy)	2019	Italy
Sept A.	Thinking Together Digitalization and Social Innovation in Rural Areas: An Exploration of Rural Digitalization Projects in Germany	2020	Germany
Kusio T., Rosiek J., Conto F.	Urban–Rural Partnership Perspectives in the Conceptualization of Innovative Activities in Rural Development: On Example of Three-Case Study Analysis	2022	Poland
Baiocco S., Leoni L., Paniccia P.	Entrepreneurship for sustainable development: co-evolutionary evidence from the tourism sector	2023	Italy
Stein V., Pentzold C., Peter S., Sterly S.	Sociotechnical infrastructuring for digital participation in rural development: A survey of public administrators in Germany	2023	Germany
Martin A., Tulla A.	Innovation, spatial loyalty, and ICTS as locational determinants of rural development in the Catalan Pyrenees	2019	Spain
Atkociuniene V., Vaznoniene G.	Smart Village development principles and driving forces: the case of Lithuania	2019	Lithuania
Sobolewska-Mikulska K., Bielska A., Sajnóg N.	Social assessment of the paradigm of multifunctional rural development - A case study of the Mazowieckie Voivodeship	2023	Poland
Cittati V., Balest J., Exner D.	What is the relationship between collective memory and the commoning process in historical building renovation project? The case of the Mas di Sabe, Northern Italy	2022	Italy
Zerrer N., Sept A.	Smart Villagers as Actors of digital social innovation in Rural Areas	2020	Germany
Zerrer N., Sept A., Christmann	Rural Community Development Click-by-click. Processes and dynamics of digitally supported social innovations in peripheral rural areas	2022	Germany
Slee B., Lukesh R., Ravazzoli E.	Social Innovation: The promise and the reality in marginalised rural areas in Europe	2022	Scotland, Austria, Italy
López, A.	Smart Initiatives to revitalize rural areas. The Smart Rural Project: Smart Villages in Basque Country	2024	Spain
Christmann, G., Sept A., Richter R.	Socially Innovative Initiatives in deprived rural areas of Germany, Ireland and Portugal: Exploring Empowerment and impact on community development	2024	Germany, Portugal, Ireland

Appendix B. Description of Preparatory Action on Smart Rural Areas 21st Century projects

Community	Country	Participatory Methods	Monitoring Actors	Monitoring Indicators
Alsunga	Latvia	Meetings, workshops, questionnaire, survey	Yes	N.I
Ansó	Spain	Workshops, interviews, questionnaires	N.I	N.I
Babina Greda	Croatia	Meetings, focus group, survey	Yes	Yes
Dingle	Ireland	Consultations, surveys, meetings	Yes	Yes
Kythera	Greece	Interviews, calls	Yes	N.I
Mouans-Sartoux	France	Meetings, survey	Yes	N.I
Mukarov	Czechia	Survey	Yes	N.I
Ostana	Italy	Meetings, public events,	Yes	Yes
Penela	Portugal	Meetings	Yes	Yes
Profondeville	Belgium	N.I	Yes	Yes
Raudanmaa	Finland	Survey, workshop, SWOT analysis	Yes	N.I
Tomaszyn	Poland	Workshops	Yes	N.I
Torup	Denmark	N.I	Yes	N.I
Uppony	Hungary	Workshop	Yes	N.I

Appendix C. Main issues and planned actions

Initiative	Main issues	Specific objectives
Alsunga - Latvia	Ageing Depopulation Low quality of life, Lack of housing	Development of local value-based small business Stabilizing the number of people in the village
Ansó - Spain	Depopulation Housing Poverty	1) Improve wi-fi connection. 2) Facilitating access to housing; 3) Fostering entrepreneurship; 4) Positively impacting the energy transition; 5) Facilitating family/social development
Babina Greda - Croatia	Ageing Emigration Infrastructure	1) Develop a more sustainable and competitive economy, primarily by adding new value to local products 2) Engage the local community and improve the quality of life, especially of the younger and older population 3) Develop a smart, environmentally-friendly and economically efficient agriculture 4) Strengthen the recognizability of the identity and the basic products and services of Babina Greda
Dingle - Ireland	Depopulation Economy Infrastructure Mobility	To enable more people to live locally year round in accommodation that is appropriate to their stage in life; To cater more directly for the recreational, education and employment needs of young people and those with young children; To foster a more sustainable model of economic development; To strengthen local governance and citizen participation in decision making relating to Smart Villages and the wider development milieu
Kythera - Greece	Ageing Emigration Infrastructure Mobility	Keeping young people on the island; Improve agriculture and promote local production; Improve environmental sustainability; Support entrepreneurial activities; Increase quality tourism; Improve services (Transportation, Education and Health)
Mouans-Sartoux - France	Business Lack of people participation	Reinforce the supply links with the neighboring agricultural production areas (Préalpes d'Azur)...; Support the resettlement of farmers on Mouans-Sartoux areas; Develop self-production in the town. Reinforce the implication of citizens in the local food policy Using digital tools to improve the dissemination of Mouans-Sartoux's good practice.
Mukarov - Czechia	Ageing Depopulation Public Infrastructure Education	Improved efficiency of the governance processes and opening the municipal office for online communication Active citizens' participation in community projects; Reducing commuting of local inhabitants; Responsible approach to the environment
Ostana - Italy	Agriculture Environment/energy Seasonal tourism Housing	1) Energy transition and waste reduction 2) Renovation of housing heritage suitable for inhabitants; 3) Reinforcement of cultural and community center; promotion of new cultural forms and community cohesion
Penela - Portugal	Ageing Depopulation Environment Valuing Local Resources	1) Promotion of environmental sustainability; 2) Strengthening social and territorial cohesion; 3) Promote the improvement of the quality of the urban environment 4) Enhancement of cultural heritage and strengthening of local identity; 5) Dynamize and boost the economy;
Profondeville - Belgium	Ageing Lack of people participation Mobility Technology/digital	1) Define and implement a data management strategy 2) Develop online public services; promote technological literacy among population 3) Develop online syndication of own tourism offer; innovate in online promotion strategy 4) Offer better infrastructure
Raudanmaa - Finland	Internet infrastructure Lack of service Tourism	1) Maintaining the communal spirit and appealing feel; ensuring smooth services for residents, visitors and tourists; 2) Developing nature/rural tourism; securing rural business viability and housing; protecting the lake ecosystems 3) Develop communication and branding;
Remetea - Romania	Lack of communication between generations Lack of public services Education	Preserving the local identity by creating a digital collection about the history of the local community; Development of smart local governance (e-governance) based on easy communication and interaction with citizens; Improving living standards by implementing projects that have an impact on the quality of life that meet the needs of the population; Improving the local educational system modernization and digitization of teaching activity; Supporting economy and agri-food sector; Intelligent public safety.
Tomaszyn - Poland	Agriculture Business Technology	1) Supporting knowledge transfers; tests and implementation of innovative solutions 2) Bio Hub Processing Infrastructure
Torup - Denmark	Infrastructure Internet infrastructure Mobility Services	Increase population by extending the village; Sustain and improve local services; Torup Tools and Talents / Support sustainability and involvement; Torup Sustainable Common Heating
Uppony - Hungary	Ageing Business Lack of service	1) Quantitative and qualitative preservation of the local water resources, promotion of their sustainable use; 2) Preservation and conditioning of local biodiversity, improving its presentability; 3) Preservation and development of local agro-biodiversity; 4) Preservation and development of landscape 5) Preservation, development and sustainable use of local cultural heritage; 6) Developing local human capital; 7) Promoting a sustainable, eco-social local economy; 8) Development of sustainable local tourism systems;

Data availability

Data will be made available on request.

References

- [1] A. Juan, J. McEldowney, *Smart Villages: Concept, Issues and Prospects For EU Rural Areas*, EPRS: European Parliamentary Research Service, Belgium, 2021.
- [2] ESPON, *Shrinking Rural regions in Europe*. <https://www.espon.eu/sites/default/files/attachments/ESPON%20Policy%20Brief%20on%20Shrinking%20Rural%20Regions.pdf>, 2020.
- [3] M. Sandelowski, J. Barroso, *Handbook For Synthesizing Qualitative Research*, Springer, New York, 2007.
- [4] O. Wolski, M. Wójcik, *Smart villages revisited: conceptual background and new challenges at the local level. Smart Villages in the EU and Beyond*, Emerald Publishing Limite, 2019, pp. 29–48.
- [5] OECD. *OECD Annual Report 2006*, OECD Publishing, Paris, 2006. <https://doi.org/10.1787/annrep-2006-en>.
- [6] K. Bokun, J. Nazarko, *Smart villages concept-A bibliometric analysis and state-of-the-art literature review*, *Prog Plann* (2023).
- [7] European Commission, *EU action form smart villages*, Available from: https://enrd.ec.europa.eu/news-events/news/eu-action-smart-villages_en, 2017.
- [8] European Network for Rural Development, *Smart Villages. Revitalising Rural Services*. EU Rural Review, 26, Luxembourg: Publications Office of the European Union, 2018. Retrieved from: https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/publi-enrd-rr-26-2018-en.pdf.
- [9] R. Pérez-delHoyo, H. Mora, *Toward a new sustainable development model for smart villages. Smart Villages in the EU and Beyond*, Emerald Publishing Limited, 2019, pp. 49–62.
- [10] E. Ocsko, *Guidebook on How to Become a Smart Village*. https://www.smartrural21.eu/wp-content/uploads/Guide_EN.pdf, 2020.
- [11] Romania, Government, *Ordonanță de urgență nr. 156 privind unele măsuri pentru susținerea dezvoltării teritoriale a localităților urbane și rurale din România cu finanțare din fonduri externe nerambursabile [Government Emergency Ordinance no. 156/2020]*, in: *Monitorul Oficial al României, Partea I*, nr. 820, 2020. <https://e-gislatie.just.ro/Public/DetaliiDocument/229805>.
- [12] M. Kaššaj, T. Peráček, *Sustainable Connectivity—Integration of Mobile Roaming, WiFi4EU and Smart City Concept in the European Union*, *Sustainability* 16 (2024) 788, <https://doi.org/10.3390/su16020788>, 2024.
- [13] T. Peráček, M. Kaššaj, *Legal Easements as Enablers of Sustainable Land Use and Infrastructure Development in Smart Cities*, *Land (Basel)* 14 (4) (2025) 681, <https://doi.org/10.3390/land14040681>.
- [14] A. Torre, S. Corsi, M. Steiner, F. Wallet, H. Westlund, *Smart Development For Rural Areas*, Routledge, 2020.
- [15] A. Vanolo, *Smartmentality: the smart city as disciplinary strategy*, *Urban Stud* 51 (5) (2013) 883–898, <https://doi.org/10.1177/0042098013494427>.
- [16] G. Lawrence, *Promoting sustainable development: the question of governance. New Directions in the Sociology of Global Development*, Emerald Group Publishing Limited, 2005, pp. 145–174.
- [17] T. Adamski, K. Górlach, *Neo-endogenous development and the revalidation of local knowledge*, *Pol. sociol. rev* 160 (4) (2007) 481–498.
- [18] P. Lowe, J. Phillipson, A. Proctor, M. Gkartzios, *Expertise in rural development: a conceptual and empirical analysis*, *World Dev* 116 (2019) 28–37.
- [19] C. Ray, *Neo-endogenous Rural Development in the eu*, SAGE Publications Ltd, 2006, <https://doi.org/10.4135/9781848608016>.
- [20] M. Rivera, K. Knickel, J. María Díaz-Puente, A. Afonso, *The role of social capital in agricultural and rural development: lessons learnt from case studies in seven countries*, *Sociol Rural* 59 (1) (2018) 66–91.
- [21] J.S. Coleman, *The Foundations of Social Theory*, Harvard University Press, Cambridge, Mass, 1990.
- [22] R. Putnam, *Tuning in, tuning out: the strange disappearance of social capital in America*, *PS: Polit. sci. polit* 28 (4) (1995) 664–683.
- [23] P. Bourdieu, *The forms of capital*, in: J. Richardson (Ed.), *Handbook of Theory and Research For the Sociology of Education*, Greenwood Press, 1988, pp. 241–258.
- [24] M.W. Foley, B. Edwards, *Is it time to disinvest in social capital?* *J Public Policy* 19 (2) (1999) 141–173.
- [25] L. Philip, F. Williams, *Healthy ageing in smart villages? Observations from the field*, *Eur. Ctry. J* 11 (4) (2019) 616–633.
- [26] A. Sept, *Thinking together digitalization and social innovation in rural areas: an exploration of rural digitalization projects in Germany*, *Eur. Ctry. J* 12 (2) (2020) 193–208.
- [27] C. Müller, D. Struzek, J. Jung-Henrich, *Participatory design in the smart village: co-design of a public display in a rural village shop*, *Mensch Comput. 2018-Tagungsbd* (2018).
- [28] L.M. Hanninger, J. Laxa, D. Ahrens, *A roadmap to becoming a smart village: experiences from living labs in rural Bavaria*, *JeDEM-eJournal eDemocracy Open Gov* 13 (2) (2021) 89–109.
- [29] A.P. Lara, E.M. Moreira da Costa, T.Z. Furlani, T. Yigitcanlar, *Smartness that matters: towards a comprehensive and human-centred characterisation of smart cities*, *J. Open Innov.: Technol. Mark. Complex* 2 (8) (2016) 1–13, <https://doi.org/10.1186/s40852-016-0035-y>.
- [30] B. Slee, *Delivering on the concept of smart villages-in search of an enabling theory*, *Eur. ctry. J* 11 (4) (2019) 634–650.
- [31] A. Gonçalves, M. Filippi, D. Galliano, P. Triboulet, *9 Business strategies for smart rural development*, *Smart Dev. Rural Areas* (2020) 197.
- [32] Greda, *Smart Village Strategy (Croatia)*. <https://www.smartrural21.eu/wp-content/uploads/Babina-Greda-Smart-Village-Strategy.pdf>, 2020.
- [33] S. Battino, S. Lampreu, *The role of the sharing economy for a sustainable and innovative development of rural areas: a case study in Sardinia (Italy)*, *Sustainability* 11 (11) (2019) 3004.
- [34] Ł. Komorowski, *Smart initiatives in a suburban community: an example from the Holy Cross mountains in Poland*, *Mt. Res. Dev* 42 (1) (2022) D1–D9.
- [35] Raudanmaa, *Smart Village Strategy (Finland)*. <https://www.smartrural21.eu/wp-content/uploads/Raudanmaa-Smart-Village-Strategy.pdf>, 2020.
- [36] T. Kusio, J. Rosiek, F. Conto, *Urban–Rural partnership perspectives in the conceptualization of innovative activities in rural development: on example of three-case study analysis*, *Sustainability* 14 (12) (2022) 7309.
- [37] Penela, *Smart Village Strategy (Portugal)*. <https://www.smartrural21.eu/wp-content/uploads/Penela-Ferraria-De-Sao-Joao-Smart-Village-Strategy.pdf>, 2020.
- [38] C.T. Soulard, S. Lardon, *Action-research helps researchers foster smart rural development: two case studies on local food policy*, *Syst. Pr. Action Res* 32 (2) (2019) 155–166.
- [39] Anso, *Smart Village Strategy (Spain)*. <https://www.smartrural21.eu/wp-content/uploads/Anso-Smart-Village-Strategy.pdf>, 2020.
- [40] Dingle, *Smart Village Strategy (Ireland)*. <https://www.smartrural21.eu/wp-content/uploads/Dingle-Smart-Village-Strategy-1.pdf>, 2020.
- [41] A.E. López, *Iniciativas inteligentes para revitalizar el medio rural. el proyecto smart rural: pueblos inteligentes en el país Vasco*, *Rev. Esp. Estud. Agrosoc. Pesq* (263) (2024) 260–286, <https://doi.org/10.24197/reeap.263.2024.260-286>.
- [42] Torup, *Smart Village Strategy (Denmark)*. https://www.smartrural21.eu/villages/orup_dk/, 2020.
- [43] R. Soligno, F. Scorza, F. Amato, G.L. Casas, B. Murgante, *Citizens participation in improving rural communities quality of life, in: Computational Science and Its Applications–ICCSA 2015: 15th International Conference, Banff, AB, Canada, June 22–25, 2015, Proceedings, Part II 15*, Springer International Publishing, 2015, pp. 731–746.
- [44] Mukarov, *Smart Village Strategy (Czechia)*. <https://www.smartrural21.eu/wp-content/uploads/Mukarov-Smart-Village-Strategy.pdf>, 2020.
- [45] Alsuga, *Smart Village Strategy (Latvia)*. <https://www.smartrural21.eu/wp-content/uploads/Alsuga-Smart-Village-Strategy.pdf>, 2020.
- [46] Kythera, *Smart Village Strategy (Greece)*. <https://www.smartrural21.eu/wp-content/uploads/Kythera-Smart-Village-Strategy.pdf>, 2020.
- [47] Tomaszyn, *Smart Village Strategy (Poland)*. <https://www.smartrural21.eu/wp-content/uploads/Tomaszyn-Smart-village-strategy.pdf>, 2020.
- [48] Mouans-Sartoux, *Smart Village Strategy (France)*. <https://www.smartrural21.eu/wp-content/uploads/Mouans-Sartoux-Smart-Village-Strategy.pdf>, 2020.
- [49] Ostana, *Smart Village Strategy (Italy)*. <https://www.smartrural21.eu/wp-content/uploads/Ostana-Smart-Village-Strategy.pdf>, 2020.
- [50] S. Baiocco, L. Leoni, P. Paniccia, *Entrepreneurship for sustainable development: evolutionary evidence from the tourism sector*, *J. Small Bus. Enterp. Dev* 30 (7) (2023) 1521–1546, <https://doi.org/10.1108/jsbed-01-2023-0003>.
- [51] N. Zerrer, A. Sept, *Smart villagers as actors of digital social innovation in rural areas*, *Urban Plan* 5 (4) (2020) 78–88, <https://doi.org/10.17645/up.v5i4.3183>.
- [52] N. Zerrer, A. Sept, G.B. Christmann, *Rural community development click-by-click. processes and dynamics of digitally supported social innovations in peripheral rural areas*, *Raumforsch. Raumordn. | Spat. Res. Plan* 80 (3) (2022) 314–328, <https://doi.org/10.14512/rur.145>.
- [53] G. Moise, A. Popescu, I.A. Bratu, I. Răducuță, B.G. Nistoreanu, M. Stanciu, *Can we talk about smart tourist villages in marginimea sibiului, romania?* *Sustainability* 15 (9) (2023) 7475, <https://doi.org/10.3390/su15097475>.
- [54] B. Slee, R. Lukesch, E. Ravazzoli, *Social innovation: the promise and the reality in marginalised rural areas in europe*, *World* 3 (2) (2022) 237–259, <https://doi.org/10.3390/world3020013>.
- [55] V. Stein, C. Pentzold, S. Peter, S. Sterly, *sociotechnical infrastructuring for digital participation in rural development: a survey of public administrators in germany*, *Communications* 50 (1) (2023) 105–129, <https://doi.org/10.1515/commun-2022-0107>.