

Veronika Stein, Christian Pentzold\*, Sarah Peter and Simone Sterly

# Sociotechnical infrastructuring for digital participation in rural development: A survey of public administrators in Germany

<https://doi.org/10.1515/commun-2022-0107>

**Abstract:** The “smart village” flourishes – at least in policy papers that envision the revitalization of rural areas through the civic deployment of networked media and telecommunications. Yet, while such aspirations are widespread, little is known about the views of those tasked with supervising and supporting digitally driven public participation for rural progress. To address the lack of insight into what these intermediary administrators conceive as catalysts and challenges for the realization of smart village conceptions, we surveyed representatives of regions in Germany who oversee rural development schemes, most notably within the European LEADER framework. For these key actors, digital participation does not mainly hinge on broadband access and IT availability. Instead, they emphasize the importance of human and administrative resources as well as multi-actor collaboration, which we discuss in terms of digital readiness, digital willingness, and digital activity. Building the smart village, we conclude, seems not so much a matter of technological infrastructure, but rather of sociotechnical infrastructuring.

**Keywords:** participation, digitalization, rural development, neo-endogenous approach, survey, social innovation, sociotechnical infrastructuring, LEADER, smart village

---

\***Corresponding author: Christian Pentzold**, Institute for Communication and Media Studies, Leipzig University, Leipzig, Germany, E-mail: christian.pentzold@uni-leipzig.de.  
<https://orcid.org/0000-0002-6355-3150>

**Veronika Stein**, Institute for Communication and Media Studies, Leipzig University, Leipzig, Germany, E-mail: veronika.stein.93@gmx.de.

**Sarah Peter**, Institute for Rural Development Research at Goethe University, Frankfurt am Main, Germany, E-mail: peter@ifls.de.

**Simone Sterly**, Institute for Rural Development Research at Goethe University, Frankfurt am Main, Germany, E-mail: sterly@ifls.de.

# 1 Introduction

Assessments of the consequences of digitally networked technologies for rural areas remain inconclusive, to say the least. From an optimistic point of view, the uptake of networked information and communication technologies (ICT) can be a part of rural development by invigorating regions that suffer, among other things, from depopulation and aging populations, economic downturn, unemployment, geographical remoteness, and poor accessibility (Park et al., 2019; Saleminck et al., 2017). Hence, national and regional governments, and the European Union (EU) in particular, have promoted the roll-out of high-capacity telecommunications networks in order to combat rural decline. Assistance provided has ranged from the provision of emergency help, to the securing of mid-range goals pertaining to well-being and quality of life, and to the achievement of long-term objectives like the safeguarding of cultural heritage and securing governability (European Commission, 1999, 2021; Visvizi and Lytras, 2018). However, on a more pessimistic note, fast-paced innovations in digital services and tools are believed to exacerbate the “rural penalty” (Hite, 1997) of interlocking structural disadvantages as they are usually adopted in urban centers first and in rural areas second (Cowie et al., 2020; Philip and Williams, 2019).

What is needed, then, is a “smart” strategy. Indeed, this trope has animated multiple acts and plans in EU policymaking, such as the Smart Specialisation under Cohesion policy, or plans for a Digital Single Market. In these instances, the vague buzzword “smart” evokes a host of connotations revolving around the integration of ICT or what we call networked technologies for the benefit of the rural community (European Network for Rural Development [ENRD], 2018a, p. 7; Visvizi and Lytras, 2018). Yet their smartness not only hinges on interconnection and technological devices, but encompasses a number of dimensions, for example, bottom-up initiatives, public-private partnerships, supportive policies, and financial resources (Zavratnik et al., 2018). In order to withstand any technocentric constriction that reframes societal issues as solvable technical problems, a smart response should emphasize citizens’ participation in political decision-making and the organization of public affairs in general, contextual peculiarities, and local development opportunities, with ICTs functioning as conducive tools. Accordingly, digital participation is about actively involving a local population in identifying challenges, creating strategies, and making choices on different stages of decision-making.

Smartness, then, is “founded on an idea of technologically driven development on one hand and on the other built around bottom up community action,” as Slee (2019, p. 647) explains. It is in this respect that digitization, that is, the process of technological transformation toward digital formats, and digitalization, that is, the ensuing societal transformations, intertwine. In that vein, the European Commis-

sion defines smart villages as “rural areas and communities which build on their existing strengths and assets as well as on developing new opportunities,” where “traditional and new networks and services are enhanced by means of digital, telecommunication technologies, innovations and the better use of knowledge” (ENRD, 2018b).

With the promise of digitally supported development and participation, “smartness” has come to serve as a versatile attribute of spatial entities, from smart countries and smart territories to smart regions, smart cities, and smart villages (Matern et al., 2020). Whereas the idea of the smart city has attracted the most enthusiasm and critique, European policymaking and expenditure has championed smartness in the guise of “smart villages,” too. Given such high-flying ambitions, research into the realization of smart village schemes is geared toward identifying both drivers and practical hurdles for such projects (for overviews, see Patnaik et al., 2020; Visvizi and Lytras, 2018; Visvizi et al., 2019; Zavrtnik et al., 2018). Reflecting the notion that a conjunction of advanced ICT and local people’s participation is vital to a “smartmentality” (Vanolo, 2014, p. 889), current studies often investigate bottom-up initiatives and technologies that foster social innovation.

Yet, what is absent from these studies is a more thoroughgoing appreciation of the perspective of intermediate actors who are tasked with facilitating the implementation of smart village plans. Despite the preoccupation of policymakers with community-led processes, especially the EU’s robust investment in rural development puts local governments in a central position. Supporting rural development in that regard means to strengthen “the social, environmental and economic sustainability of rural areas” (European Commission, 2022). As a consequence, Wolski and Wójcik (2019) postulate that the “creation of community potential is not an independent process and needs the support of appropriate institutions [...] and the establishment of partnerships especially at the local level as well as the readiness of institutions managing development to join grassroots initiatives” (p. 34). That directs our attention toward professional representatives who assume a crucial position in facilitating and managing digitally enhanced development processes, acquiring and channeling funds, and liaising with other local actors, which includes the local community as well. This is what we call sociotechnical infrastructuring. Against that background, we ask: What do intermediary public administrators conceive as catalysts and challenges for realizing smart village conceptions?

## 2 Smart village: The vision

Despite the hype surrounding smart cities, in 2018 rural and intermediate areas constituted 88 % of the EU's territory, and were home to 55 % of its population. Yet their gross domestic product per capita stood at only 72 % of the EU average, and the share of young people (0–14) was decreasing (European Union, 2018). Moreover, rural broadband coverage continues to be lower than national coverage across the EU, with only about two thirds of the rural population having access to high-speed services (European Commission, 2022). In this situation, the idea of the smart village has gained traction. In fact, becoming smart through advanced ICT and civic participation appears like a panacea for the ills that afflict rural areas. Yet, due precisely to the enormous expectations around smart villages, their realization is far from straightforward.

At the heart of smart village conceptions lies a vision of local engagement and empowerment that is fostered by digital technologies. The smart village comes into being through local communities that “refuse to simply wait for a change to happen to them” (Atkočiūnienė and Vazonienė, 2019, p. 504) and instead actively seek to implement change. This idea of digitally fostered agency runs against the view of rural areas as passive and backward-looking. Instead, it positions residents as agents of revitalization and improvement who appropriate ICT for civic purposes.

Within the EU, the vision of the smart village can be traced back to the 2016 Cork 2.0 Declaration (ENRD, 2016; see also de Viron and Mudri, 2019). It underscored that rural development across Europe should promote “the potential of rural areas and resources to deliver on a wide range of economic, social, and environmental challenges and opportunities benefitting all European citizens” (ENRD, 2018b, p. 1). The EU Action for Smart Villages (European Commission, 2017), a policy concept, followed this call, and a Thematic Working Group and Smart Villages Portal were launched under the European Network for Rural Development (ENRD). Moreover, the long-standing LEADER program (Liaison Entre Actions de Développement de l'Économie Rurale), an approach to policy implementation that has been part of the EU Rural Development Policy framework since 2007, was redirected to support smart village strategies through a mix of advice and grant aid (Nieto and Brosei, 2019). The LEADER program supports knowledge transfer, investment in physical assets, farm and business development, basic services and village renewal, collaboration, and community-led local development (CLLD) measures. In the EU funding period from 2014 to 2020, LEADER had a budget of €9.8 billion. As of 2018, LEADER was implemented by around 2,800 multisector Local Action Groups (LAGs) that reached 61 % of the EU's rural population and brought together public, private, and civil-society stakeholders (ENRD, 2022).

In the Bled Declaration of 2018, a number of features were associated with the smart village. It describes the smart village as encompassing a variety of approaches that aim at leveraging digital technologies for a shared economy, waste reduction, renewable energy, and tourism, while also using digital platforms for services like education, health, administration, transport, or retail (ENRD, 2018a). In their overview, Atkočiūnienė and Vazonienė (2019) count 11 smart village characteristics ranging from rural services and new forms of business and technology to food supply, recreation, and communal life. The ENRD devised a “digital ecosystem” (2018a, p. 35) for smart villages that encompasses four levels: social actors including residents, clubs, businesses, municipalities, and science; digital services; technical platforms; and basic infrastructure. These layers are joined by an organizational layer that includes a mix of elements like business models, living labs, digital hubs, and digitization roadmaps. This vision is not limited to the EU, but has also been taken up by the Organization for Economic Cooperation and Development (OECD) in its rural policymaking principles. It has inspired initiatives for rural development in several countries like Indonesia (Fahmi and Arifianto, 2022) and Niger (International Telecommunication Union, 2020).

### 3 Smart village: Its realizations

Several goals are pursued in the realization of smart villages: first, to sustain and deepen the embeddedness of residents in their local communities by fostering interest in communal concerns; second, to further the relatedness of people and institutions seeking to solve local problems; and, third, to strengthen the connectivity and readiness for emerging challenges that come with the availability of ICT (McCann and Ortega-Argilés, 2015). However, the diversity of rural areas requires an adaptation of any kind of blueprint for a smart village (Komorowski and Stanny, 2020). It necessitates, as Wolski and Wójcik (2019) explain, a sensitivity to local circumstances, the mobilization of local potentials for innovation, and a shared responsibility of local stakeholders and institutions. In effect, it means “establish[ing] structures, environments, and climates at the local level in order to help implement the model of the smart village” (p. 40). As a result, we find not one but many smart village realizations.

Notwithstanding such diversity, they arguably predicate on three key aspects. First, the technological and administrative preparedness for advancing digitally driven civic participation, i. e., a community’s digital readiness. Second comes digital willingness, i. e., a population’s openness to change, and its inclination toward embracing digital formats to enhance rural regional development. Third is

digital activity, which refers to local actors and their contribution in forming and sustaining rural development initiatives. In one way or another, notions of digital readiness, digital willingness, and digital activity undergird common conceptual frameworks of social innovation and neo-endogenous growth that are employed both to study and to steer rural development.

## **Social innovation**

Research on social innovation has outlined how smart village schemes can drive rural development (ENRD, 2018b; Slee, 2019). Social innovations which incorporate the realization of smart village plans are “social” in three ways (Moulaert, 2009; Noack and Federwisch, 2018). First, they address previously unrecognized social needs. Second, they involve people who would otherwise be excluded from social learning processes, collective production, and knowledge exchange (Bock, 2012; Dargan and Shucksmith, 2008; Neumeier, 2017). Third, they benefit from and reciprocally bolster social relationships, thus enhancing social inclusion and cohesion. Social innovations are therefore, as Mulgan and Pulford (2010) claim, “innovations that are social both in their ends and in their means” (p. 17).

Unsurprisingly, the value-laden concept of social innovation has been embraced by policymakers because it promises to enliven the innovative spirit of rural areas, deliver on unmet challenges (like employment opportunities, health care, or transport), and pursue the larger public good. In that respect, social innovation is deemed to bolster a population’s digital willingness and promote digital activity. In other words, the existence and implementation of social innovation rely on the specific composition, the needs and shared beliefs of collectives, which may include some groups and exclude others and their respective requirements. Regarding the realization of smart villages, the concept of social innovation further highlights the role of “co-operatives and collective action with self-determination, self-management and self-reliance” (Bock, 2016, p. 562).

## **Neo-endogenous growth and public institutions**

While social innovation might empower local communities on the one hand, it can also indicate state withdrawal on the other, as responsibility for maintaining digital readiness may be relocated from public institutions to private citizens (Bock, 2016). It also leaves open to what extent it prioritizes local resources and local collective action, and it does not specify where it may rely on external factors (Terluin, 2003). Neo-endogenous approaches offer such a perspective that updates and relates both

endogenous and exogenous views on growth. They posit that social innovation and the provision of digital readiness stems from the interplay between local communities and external actors and forces (Bosworth et al., 2015; Ray, 2006).

In contrast to endogenous concepts which diminish the role of governmental institutions and the administration and exogenous concepts that overemphasize their importance, neo-endogenous approaches shift our attention toward the state as a “co-ordinator, manager or enabler rather than as provider or director” (Shucksmith, 2010, p. 4). In this view, public institutions do not exert power over rural areas, but should empower local actors to address a task at hand. A neo-endogenous approach thus offers a more realistic and practicable approach toward digital readiness, and, in a second step, the existence and robustness of digital willingness and activity: First, there is a risk of overburdening participants and volunteer burnout in purely community-led ventures. Second, local actors are highly diverse. They may cohere on some issues and diverge on others, both among themselves and with external actors (Salemink and Strijker, 2016). In sum, Terluin (2003) therefore notes that in a neo-endogenous approach, “local policy makers and entrepreneurs are the main actors”, but they often receive “encouragement from upper administrative levels or other external actors, such as development agencies and universities” (p. 343).

## 4 Intermediary administrators and infrastructure work

In line with neo-endogenous approaches, Wolski and Wójcik (2019) argue that local administrations possess capacities that are essential for the implementation of smart development. They are part of the governmental authority but also maintain close interaction with residents, civic associations, grassroots movements, and nongovernmental organizations. They thus reside at an intermediary level. The representatives of these institutional bodies are in charge of development schemes (usually in collaboration with local actors), are responsible for acquiring funds and overseeing their allocation, and monitor EU policy initiatives and the opportunities that arise from them.

They thus engage in infrastructuring or “infrastructural work” (Star and Bowker, 2002, p. 233), that is, they seek to integrate and connect the resources, practices, and actors that make up a functional infrastructure. Since the vision and the realizations of smart villages rest on multiple factors, infrastructuring efforts are required to interconnect vital resources, practices, and actors. The smart village is not only about digital readiness and therefore IT provisions, but it necessitates an element of digital willingness and notable digital activity that are not given but

have to be facilitated. Whereas the notion of infrastructure denotes the interrelated material, social, and organizational arrangements in support of human activities and technical operations (Bowker and Star, 1999), infrastructuring directs our attention to the ongoing work that is necessary to create, uphold, and steer these sociotechnical enablements. They are sociotechnical in character because they associate human actors with material setups (Karasti, 2014).

From a neo-endogenous perspective, public administrators engaging in the practical work of infrastructuring are key to establishing and fostering rural development. At best, sociotechnical infrastructuring can help realize smart village visions by enabling social innovation. As research on civic engagement in local political consultation and policymaking has shown, the perspective of public officials matters: Their attitude toward civic involvement and understanding of the people participating in such ventures contributes significantly to their capacity and effectiveness (Callahan, 2007). Whereas the opinions and requirements of local residents have frequently been queried, mostly in the context of case studies, there is currently no comprehensive survey on the perspectives of key actors from the intermediary levels of local administration and publicly funded development agencies in the EU. A study by Pollermann et al. (2013) examined the impact of LEADER in Germany on improving smart places through bottom-up forms of civic participation. Another more recent large-scale survey of German LAGs from 2017 was mainly interested in questions of internal LEADER implementation, operations, and improvements (ENRD, 2018c). The questionnaire distributed to experts from the project on Smart Digital Transformation of Villages in the Alpine Space concentrated on policy instruments and impact (Stojanova et al., 2021).

## 5 Methodology

Turning to digital participation in rural development, the views of intermediate actors pursuing sociotechnical infrastructuring in regional agencies and the communal bureaucracy remain understudied. The administrators' assessment of technological preparedness, of a community's openness to change and to embrace digital formats, and the recognition of actors and their contributions forms, however, an important prerequisite for building smart villages. For sure, they require durable infrastructures of resources, practices, and actors, yet these do not exist on their own or are pre-given but have to be established and maintained. Intermediate actors fulfil a crucial role in facilitating such infrastructures – the conditions of possibility for rural development – which renders their assessments of and orientations toward digital readiness, willingness, and activity critical. The overarching



interested in this study then lies with what public administrators consider as catalysts and challenges for realizing smart village conceptions.

Given the lack of knowledge, we do not formulate hypotheses, but rather orient our exploration toward the following questions: How do public administrators assess a region's preparedness for digitalization and for advancing digitally driven civic participation (RQ1)? What do they think of a local population's openness to change and its inclination toward embracing digital formats for participation (RQ2)? Who do they recognize as engaging in digital rural development (RQ3)? Note that the point is not to assume that administrators are competent enough to provide only correct and comprehensive answers. But to say that they might not be able to have a complete overview on digital readiness, willingness, and activity does not mean their perspectives are invalid or misguided. Rather, they offer us a professional perspective, not their personal views, which ultimately shapes their role and relationship with other actors and institutions, and their engagement in coordination and administration. The same holds true for their crucial contribution to infrastructuring that, as a notion and way of conceptualizing their facilitating efforts, might go unrecognized.

To gain an overview of local administrators' perspectives on drivers and obstacles for rural development, we conducted a survey that was distributed online to representatives of German regions that have participated in rural development schemes, most notably within the LEADER framework. LEADER particularly resonates with smart village conceptions because it pursues a place-based approach, embraces a holistic and multisectoral view toward regional development, and endorses social innovation (Nieto and Brosei, 2019). Together with France, Spain, and Poland, Germany is one of the main benefactors of the program with more than 300 LAGs. Some of its LAGs (2014–2020) administer the largest individual LAG budgets in the EU of over €9 million. This enables them to invest in smart village plans, including technologies and services, and to back pioneering projects (Nieto and Brosei, 2019). Moreover, what makes Germany an interesting and information-rich site for the survey is the high level of internet penetration and rural development compared to other EU member states (European Commission, 2022).

In line with the three research questions, the survey's 36 items were grouped into three broad categories that collected input on the following themes: (1) digital readiness: the socioeconomic and structural characteristics of a region plus existing funding schemes; state of digitization, IT security, and regional resources; (2) digital willingness: acceptance of digital and offline formats; core actors' position toward participatory offerings as well as regional advantages and disadvantages; and (3) digital activity: digitalization strategy and its aims; urban-rural relationship and the impact of digitization on living conditions; participatory formats at different steps of the policy cycle, from problem definition to process evaluation; development

and status of digital and offline formats. In some points, this aligns with categories addressed in other projects on smart villages and rural digital ecosystems. The Territorial Digital Assessment Tool includes, among others, categories of connectivity, digital education, and actor networks. It too stresses the role of support services and governance (CARPE DIGEM, 2022). The policy recommendations offered by the Interreg Alpine Space (2022) project follow some of the same priorities.

Although our interest is more general, we added a category of items regarding the possible effects of COVID-19 on the demand for and significance of digitally driven civic participation offerings (the full questionnaire can be accessed here: [https://www.sozphil.uni-leipzig.de/fileadmin/user\\_upload/Beispiel\\_Detailleitfaden\\_angepasst.pdf](https://www.sozphil.uni-leipzig.de/fileadmin/user_upload/Beispiel_Detailleitfaden_angepasst.pdf)) The survey was administered via the online SoSci Survey platform, and included single-choice and multiple-choice questions, answer selection via drop-down menus, multiple-choice matrixes, rankings, and two-way sliders. We mainly employed symmetrical Likert-items and analyzed the data using SPSS.

To create a comprehensive sample, we collected contact information from all corresponding key actors responsible for implemented rural development schemes. Due to region-specific rural characteristics, the regions did not neatly map onto existing political constituencies but were specified by the relevant action. Besides LEADER, this includes state-funded programs and pilots, some of them only available in certain regions, namely Integrierte Ländliche Entwicklung, Land.Digital, Smarte.Land.Regionen, MOROdigital, and Land(auf)Schwung. Like LEADER, these programs focus on community participation and social innovation in rural areas. Our search yielded a list of regions as defined by the respective scheme, which means that there could be territorial overlaps as well as geographical gaps. Of the 368 administrators invited, a total of  $N = 152$  completed our survey, most of them engaged in LEADER (96.7%). We achieved an above-average response rate for online surveys of 41.3%, and a representative sample of regions in proportion to the distribution of LAGs across Germany.

## 6 Results: Assessing the conditions for digital rural development

### Digital readiness

Regarding the preparedness for advancing digitally driven civic participation, i. e., digital readiness, the answers drew a highly ambiguous picture (RQ1). Asked about a region's overall state of digitalization, almost two thirds of respondents (62.2%)

were unwilling or unable to make either a positive or negative statement and instead chose “mixed.” This reluctance to give a more definitive answer might stem from more than one reason. First, it may be attributed to the fact that resources for digitalization vary greatly within the region itself. Second, respondents might hesitate to reduce a complex situation to a misleadingly clear statement. Third, this hesitation might be owed to the early stage of the development process itself. Finally, it could be an expression of the deficient knowledge of certain officials, especially in the field of IT security. We asked about their assessment of IT security because a lack of certainty or evident issues with IT security might impede digitalization ventures. More than 40 % did not give a decisive answer. However, of those who did opt for a more explicit response, the majority gave a positive assessment of the state of IT security. This may indicate uncertainties in appraising the situation, for instance due to lack of expertise, competencies lying with other actors, or IT security playing a rather subordinate role.

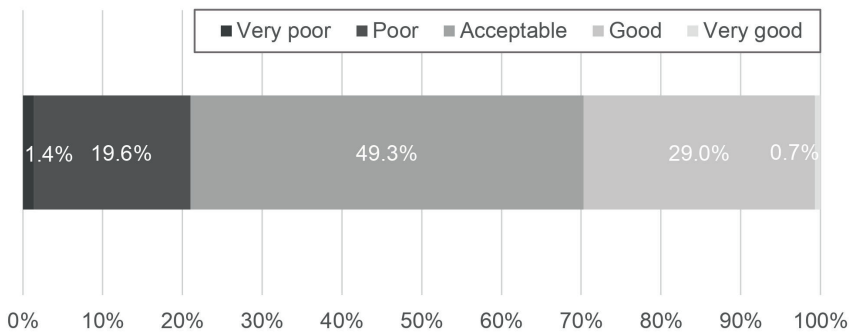
Upon closer inspection, there appears to be a strong awareness of the shortage of financial and human resources. About 40 % and 50 % of answers, respectively, deemed them insufficient. By contrast, most respondents did not see technological infrastructure encumbering a region’s digital readiness. Again, it is difficult to give a straightforward explanation for this. However, it seems that at least in the German context of comparatively widely available high-speed networks and services, the investment in broadband expansion has been effectual. In this context, public expenditure could be targeted more toward the lack of resources for local initiatives and for establishing and upholding administrative support architectures (Table 1).

**Table 1:** Resources for digitization.

Measure	%					N
	Very poor	Poor	Mixed	Good	Very good	
Technical infrastructure	2.1	21.2	49.3	24.0	3.4	146
Hardware and software equipment of public institutions	2.3	33.8	47.4	16.5	0	133
Professional expertise	1.6	27.4	54.0	14.5	2.4	124
Financial resources	7.5	33.3	35.0	23.3	0.8	120
Human resources	4.1	43.8	38.8	13.2	0	121
IT Security	3.4	22.5	40.4	30.3	3.4	89
Overall state of digitization	0.8	24.4	62.2	12.6	0	127

*Note.* Survey question: “How do you assess the current status of digitization in your region with regard to the following aspects?” These are rounded numbers.

Furthermore, it is striking that, although the overall assessment of digital readiness was rather poor, some administrators considered their regions well prepared for driving digital offerings in the coming years (30%). Nevertheless, again, nearly half of the answers were undetermined. At best, this might reflect the difficulty of translating nuanced views into a limited set of response options. At worst, it demonstrates an absence of conclusive insights even from those who are tasked with overseeing and steering programs for regional development. Moreover, there may also be an element of self-efficacy at play as public officials express their trust in a region and its administrators to master ensuing challenges (Fig. 1).



**Figure 1:** Ability to drive digital services in the future.

*Note.* Survey question: “How well prepared do you think your region is to drive digital offerings in the coming years?” N = 138.

When we further explore the relationship between resources for digital readiness and the structural characteristics of a region, it becomes evident that, with the exception of socioeconomic performance, location has an impact on the availability of certain resources, like network accessibility (Table 2). Overall, socioeconomic performance correlates most strongly and positively with the availability of resources, especially financial resources (correlation of .523,  $p < .01$ ) and the overall assessment of digitalization (.32,  $p < .01$ ). Regarding socioeconomic performance, it is not clear whether this was estimated to be better because the region had access to larger financial resources, or whether funds were concentrated in socioeconomically better-performing regions.

**Table 2:** Spearman's rank correlations between resources and location.

Spearman's Rho		Socioeconomic situation	Location/ accessibility	Rurality
Technical infrastructure	Correlation	.182*	.122	.225**
	Sig.	.03	.071	.003
	N	142	146	146
Hardware and software equipment of public institutions	Correlation	.064	-.003	-.056
	Sig.	.469	.488	.262
	N	129	133	133
Professional expertise	Correlation	.233**	-.24	.03
	Sig.	.01	.397	.368
	N	122	124	124
Financial resources	Correlation	.523**	.353**	.122
	Sig.	0	0	.093
	N	117	120	120
Human resources	Correlation	.189*	.107	.03
	Sig.	.041	.122	.372
	N	117	121	121
IT Security	Correlation	.174	.036	-.058
	Sig.	.108	.37	.295
	N	86	89	89
Overall	Correlation	.315**	.129	.016
	Sig.	0	.075	.429
	N	123	127	127

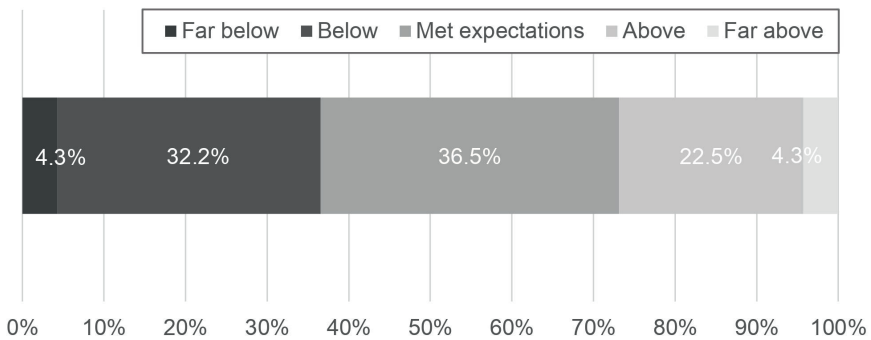
*Note.* \* Correlation is significant at the .05 level (one-sided; two-sided for socioeconomic status).

\*\* Correlation is significant at the .01 level (one-sided; two-sided for socioeconomic status). Survey question for resources: "How do you assess the current status of digitization in your region with regard to the following aspects?" (very good, good, mixed, poor, very poor). Survey questions for location: "How do you assess the socioeconomic situation in your region?" (very good, good, mixed, poor, very poor), "How would you rate the geographic location/accessibility of the region?" (very central, central, mixed, peripheral, very peripheral), and "How would you rate the degree of rurality of your region?" (very rural, rather rural, mixed, non-rural/urban).

## Digital willingness

Since the idea of digitally fostered engagement and empowerment forms a centerpiece of the smart village, the survey focused specifically on the participation of local populations in matters of regional development. When asked about a local population's openness to change and its inclination toward embracing digital formats to enhance rural regional development, i. e., its digital willingness, 63% of respondents noted that means for digital participation were accepted by local

citizens as they expected them to be accepted or even better than expected (RQ2). Still, a considerable portion of respondents were disappointed by the absence of activity, with one third of them stating that engagement was worse than expected (Fig. 2). Respondents could use open-ended questions to explain why some digital formats had been discontinued, a step usually taken when usage failed to meet the expectations associated with their initiation.



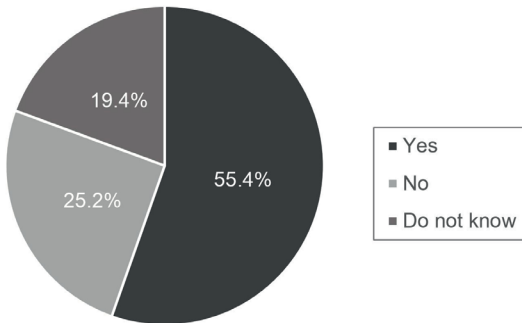
**Figure 2:** Digital participation opportunities and their acceptance.

*Note.* Survey question: “How are digital participation opportunities received by citizens?” N = 93.

According to respondents, citizens were taking an active role in reshaping their region. These respondents (N = 138) described the population as very active in about 30 % of the regions. Yet, when they were asked to indicate whether the local population was skeptical or open to digital innovations, whether it experienced more or less difficulties in accepting change, and whether it showed a more or less positive attitude to change, residents were seen as less willing to change and, closely related to that, less open to innovation. When they were asked what would impede enduring digital civic engagement, officials responded that citizens were quite averse to innovation but were interested in partaking in policymaking for civic causes. Those tasked with promoting digital participation thereby tended to reiterate a cliché of rural backwardness (Kühn, 2015; Noack and Federwisch, 2018). By contrast, connectivity was less frequently seen as a hindrance.

Unleashing digital participation for rural development therefore seems more a matter of human capabilities and motivation than of technological capacity. The unfavorable assessment of digital willingness reappeared frequently in answers to our open-ended questions about the main hurdles for digitally driven civic participation. The most prevalent response, found in about a quarter of the answers (N = 123), indicated reservations among residents toward digitally driven change,

followed by their low level of acceptance of digital innovations. However, more than half of the officials recognized an increased interest from citizens in opportunities for participation in local decision-making, thus counterbalancing the negative image suggested by other responses to some extent (Fig. 3). Yet it is noteworthy that about one quarter did not give an answer to the question (N = 112).

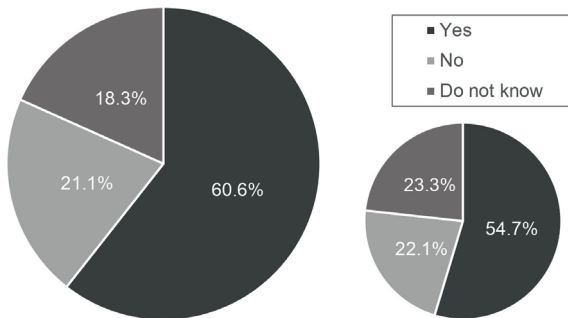


**Figure 3:** Perceived change in interest of the local population in participation.

*Note.* Survey question: “Has there been an overall increase in citizen interest in opportunities for participation in recent years?” N = 139. These are rounded numbers.

A more positive assessment of digital willingness also appeared with respect to the ongoing COVID-19 pandemic, with 60 % of officials recognizing a higher demand from citizens for regional digital offerings; almost 55 % also saw a rising need for participatory formats (Fig. 4). This underscores the widespread shift toward digital formats during the pandemic, but leaves open the question of whether such demand will impact rural digital participation after the crisis.

Taken together, the responses indicate that, on the one hand, there seems to be a demand for digitalization measures from citizens. Yet on the other, there is uncertainty on the side of intermediaries as they perceive a divergence between their efforts, the available resources for digitalization, and the expected reaction from citizens. Indeed, there are no statistically significant correlations between digital willingness and the extent of digital participation offerings. This leaves room for interpretation, for instance regarding the ability of respondents to assess the population as such. It might also be the case that the needs for digital participation perceived by administrators does not accurately reflect the needs of the target population. Nevertheless, the demand for digital participation has increased and citizens are more likely to become actively involved in regional development issues. Still, respondents emphasized that digital options were less successful than offline options in bringing about effective and integrated participation.



**Figure 4:** Perceived change in demand for digital offerings due to Covid-19.

*Note.* Survey question: “Has there been an increase in demand for regional digital offerings from citizens during the Covid-19 pandemic?” (left) This was followed by a filter question asking whether this increase in demand also applies to digital participation offerings (right). These are rounded numbers. N = 142.

## Digital activity

The respondents discussed a number of players who form and sustain rural development initiatives, i. e., digital activity (RQ3). The five stages of such initiatives – cocreation, initiation, dissemination, usage, and improvement – that were captured by the survey are roughly based on the common steps of innovation processes (e. g., Häikiö and Koivumäki, 2016). On this token, respondents most frequently selected collaboration with universities (of the five possible phases, universities were involved in an average of 2.25), usually during the stages of cocreation and initiation; followed by companies (2.04). Collaboration with urban regions, selected on average only once, was chosen least frequently. Process-specific knowledge brokers such as multipliers or other assisting actors for digital processes played a greater role, especially during the initial stages of cocreation, initiation, and dissemination (Table 3).

**Table 3:** Relevant actors for digital services in different phases of innovation.

Measure	%				
	Cocreation	Initiation	Dissemination	Usage	Improvement
Citizens	16.1	11.2	24.5	67.8	21.7
Knowledge brokers	30.8	32.2	36.4	18.2	21.0
(Cooperations with) state or federal authorities	21.0	34.3	16.8	17.5	11.9



**Table 3:** (continued)

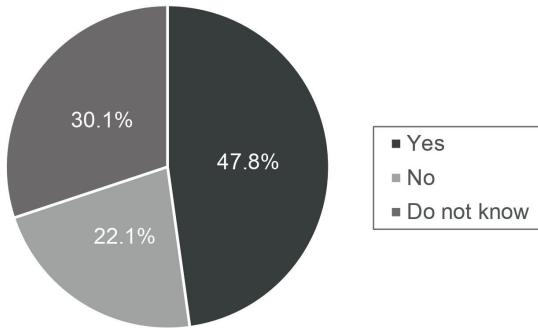
Measure	%				
	Cocreation	Initiation	Dissemination	Usage	Improvement
Companies	23.8	27.3	25.2	39.2	21.7
Universities	38.5	33.6	23.8	19.6	28.0
Other educational institutions	22.4	26.6	24.5	28.0	12.6
(Cooperation with) other urban regions	8.4	9.1	12.6	11.2	7.7
(Cooperation with) other rural regions	20.3	20.3	25.2	27.3	21.0

*Note.* Survey question: “Which actors play an active role in the ... of digital services?” N = 143. These are rounded numbers.

Groups of actors depend on each other as they seek opportunities for participation during the five phases, resulting in collaborations in multi-actor constellations. For example, regions that collaborate with universities frequently also collaborate with other stakeholders such as companies. Local citizens are an exception to this rule as they were believed to act independently of other actors, especially as users of digital services. These results indicate that collaboration tends to expand in places where it already exists: A small number of regions maintain numerous ties while others have hardly any. The same sort of clustering can be found for digital information and participation offerings. However, the number of regions in which digital participation offerings are a stable component is very small. In fact, they are predominantly in a pilot stage, which applies even to regions with a high number of digital participation formats and regardless of how well accepted they are by the population. This raises the question under which circumstances the transition from pilot project to permanence can be successful and what this would require.

Group differences also emerged in terms of active participation. As intermediaries in the field of regional management, a key task for our respondents was to install and monitor participation opportunities for the public. Against this background, one section of our questionnaire inquired about the status of offline and online participation practices, focusing on experiences and assessments of digital participation as a component of smart village schemes. With respect to residents preferring offline or digital formats for participation, almost 50 % of public administrators considered the cohort of active citizens to be more heterogeneous in online-based than in offline participation, provided they were able to make an assessment based on their experience (N = 95). Once again, almost a quarter of respondents opted to indicate neither yes nor no but were undecided (Fig. 5).

Citizens embracing online formats were believed to be younger (93.75 %, N = 80), while those choosing offline variants were considered more likely to be



**Figure 5:** Participants in online and offline participation.

*Note.* Survey question: “In your opinion, is the group of citizens who participate in regional development issues online more heterogeneous than with offline participation?” N = 136. These are rounded numbers.

male (37.5%) and with a lower level of education (26.25%). Thus, even though group differences were recognized, digital participation was treated as a means to expand target groups and reach a broader base of the local population. Queried about goals to be addressed through digital offerings, ranked third was “creating and strengthening a participatory culture” (53.3%), while 64.5% of respondents named “support and strengthening of structures that promote the common good,” and 63.8% chose “promotion of networking, knowledge transfer and collaboration” (N = 152).

## 7 Discussion: Infrastructuring for rural smartness

Asked about resources for digitalization, public administrators pointed to a lack of human resources rather than technology. In fact, irrespective of their more or less positive assessment of the material circumstances, our respondents tended to see their own region as well prepared for promoting digital services in the future. This does not mean that digital infrastructure is not an important concern in rural areas, but it plays a subordinate role when set in relation to other resources (which underscores the multiple conditions that are necessary for successful rural digital development). Therefore, when we consider the role and position of the administrators in our survey, we may conclude that, in order to pursue a “smart” development approach alongside social innovation and civic, digitally fostered participation, broadband and ICT can at best be regarded as prerequisites for sociotechnical infrastructuring, not its end.

More generally, sociotechnical infrastructuring is a multifaceted endeavor that entails a palette of strategies. It is a proactive and ongoing process of mobilizing and connecting human actors through technological, financial, and administrative support structures. Sociotechnical infrastructuring must not necessarily lead to social innovation, but it can facilitate the resources and relationships that are conducive for the participation and collaboration of actors, both local and potentially within transregional networks. In such an environment, digital technologies are integrated into social practices. It is this intertwining of sociality and materiality that affords social innovation, not technological tools alone (Guzal-Dec, 2018; Sept, 2020). Sociotechnical infrastructuring can be born out of necessity, demanded by the dearth of available means and connections; it can also grow from a position of strength. Moreover, while sociotechnical infrastructuring seems beneficial to bringing forward rural development, administrators may respond to some of the ensuing tasks and adopt the corresponding mindset while forgoing others.

Consequently, sociotechnical infrastructuring demonstrates that the views of intermediaries who were our respondents in this survey support and guide rural digital development (Cambra-Fierro and Pérez, 2022). Besides technological conditions, policies, and funding opportunities, their perceptions of digital readiness, willingness, and activity shape day-to-day decisions and administrative operations and plans. This crucial role of professional views is also stressed by other surveys of functionaries on citizens' input in local management and service functions. For instance, Nalbandian (1999) has shown that city management professionals in the US consider community building one of their core tasks. However, Callahan and Yang's (2005) survey of US public administrators indicated that only 7% received professional training to promote citizen participation, which presumably jeopardizes efforts to implement measures for participatory decision-making. Based on interviews with public administrators and citizens, King et al. (1998) censured the unequal relationship existing between them. This inequality allows administrators to prefigure and control the ability of citizens to participate, thereby frustrating effective dialogue and deliberation. At worst, it can mean that administrators have a tokenistic understanding of civic participation, and only treat it as a "palliative for the challenges posed by exclusionary or unpopular policies, or a constraint imposed by external pressures," Ianiello et al. (2019, p. 27) criticize. By contrast, their review makes clear that the most effective arrangements rest on criteria for pluralistic community representation and on processes designed around principles of equality, civility, and inclusivity.

Administrators require a certain level of expertise to properly administer the resources that are necessary for establishing social infrastructures. Yet some of the responses in our survey suggested that officials did not feel competent to assess IT security; around a third of them felt insecure, or very insecure even, when handling digital tools and services (N = 140). We must take into account that intermediaries in

regional management have diverse vocational backgrounds that may not necessarily include technical skills and IT competences. Nevertheless, IT security in particular is growing to be a major concern in digitalization ventures as potential security gaps and trust issues threaten to hinder the uptake of digital innovations (Müller and Skau, 2015; Tragos et al., 2017). Therefore, sociotechnical infrastructuring also involves providing tech support, either within the administrative apparatus and in collaborative networks or on a contractual basis by ad hoc commercial providers. Whereas this latter kind of partnership is dictated by a deficit, sociotechnical infrastructuring also extends to purposive collaboration with different groups of actors to increase existing resources and networks.

As a case in point, when asked about the general goal of implementing digital tools and services, the officials frequently opted for the promotion of networking, knowledge transfer, and collaboration. This corroborates earlier findings which stress the importance of external knowledge and networking for social innovation. Often, rural areas are depicted in this line of thinking as having fewer possibilities for such sort of sociotechnical infrastructuring than urban regions due to geographic distance and lack of local agglomeration (European Commission, 2010; McCann and Ortega-Argilés, 2015). Yet, despite these advantages of urban settings, we were surprised to learn that collaboration with urban regions only played a minor role for administrators. While they considered sociotechnical infrastructuring along the vertical axis of town and village advisable, horizontal collaboration among rural municipalities was deemed more relevant. This runs counter to a number of existing smart village plans that underscore the unique potential of rural-urban partnerships (Certomà, 2021; ENRD, 2018a; Guzal-Dec, 2018) in which urban regions feature as “innovation machines” (Florida et al., 2017).

Various EU directives promote urban-rural partnerships, although there is still a lack of practical implementation (OECD, 2013; Urban-rural Partnerships, 2020). Notwithstanding possible advantages, the officials rated other forms of collaboration as more important. Arguably, they thus relinquished a beneficial form of sociotechnical infrastructuring because linkages between urban and rural areas can foster “smart territorial relationships” (Ravazzoli et al., 2018), and contribute “to a hybrid, relational and participatory perspective that allows experimentation as well as integrates stakeholder and bottom-up initiatives for sustainable regional development” (Matern et al., 2020, p. 2070). Rural regions close to urban centers could form such clusters and benefit from collaborative ventures with knowledge-spillovers and innovation transfer from towns to the countryside (Naldi et al., 2015). In addition, when asked about collaborations, it became apparent that partnerships were to be sought primarily in places where such ventures already existed. This tends to lead to few well-connected rural regions which may be able to capitalize on such ties, whilst others run the risk of falling further behind.

## 8 Conclusion

Taken together, the opinions of public administrators about the digital readiness, willingness, and activity of the local community underscores the ineffectiveness of instrumental, technology-centered approaches toward rural development. By contrast, the success of local digital development and participation in the sphere of social innovation fundamentally hinges on the recognition, valuing, and mobilization of the capabilities of citizens. This then challenges solutionist thinking and smart villages schemes which assume that more technology will generate an active citizenry and civic participation.

The situation creates opportunities for low-tech approaches that do not require large monetary funds, such as the sociotechnical infrastructuring of administrators and their enabling alliance with local actors and collaborative networks. The survey data point us toward this calibration of the capacities, expectations, and experiences of actors as well as the importance of promoting an environment in which social innovations can thrive (Sept, 2020). Risk mitigation and support structures backed by institutions can be beneficial here, not only through administrative actions, but channeled through resourceful external actors and liaisons with urban regions. The question of how that might be achieved has not been part of the survey, and we hope to address this limitation with subsequent interviews and focus groups. Admittedly, most of the questions we asked were exploratory in nature and quite broad, and should, in a next round of interviews, be detailed and tailored to the different positions and roles of the actors involved in rural development. Follow-up research should also help to clarify how local administrators understand their role and their own readiness, willingness, and activities of engaging in sociotechnical infrastructuring.

In sum, the results underline Wolski and Wójcik's (2019) assertion that the "creation of community potential is not an independent process" (p. 34), but needs support and partnerships, i. e., sociotechnical infrastructuring. This stresses the significance of collaboration and networking as much as it underscores the importance of the perceptions and expectations of the actors involved, especially public administrators. Employing ICT and forging novel partnerships both across spheres and within local areas all form part of a strategy for regional digital development, together with the views and experiences of intermediaries. Our survey indicates that officials are ambivalent about the digital readiness, willingness, and activity in their region. On the one hand, they consider the population to be rather inert when it comes to digital participation offerings and initiatives for change. On the other, they perceive an increased public interest in participation in regional development and digital offerings. Relatedly, administrators note that residents care about regional issues and that this demand could be met by implementing digital

participation features. Both supply and demand for digital opportunities increased during the COVID-19 pandemic. However, the survey also shows that even when digital offerings were well received or where many such ways of engagement exist, they remain pilots.

Arguably, going beyond this stage of testing to arrive at a more robust implementation of digital participation for rural development is not only a matter of resources and collaboration, but also of expectations and recognition. Aligning the views of different actors involved in social innovation takes time, even though there is often an expectation of immediate results (Guzal-Dec, 2018). While technological innovations and funds are commonly meant to effect short-term changes, especially within state-driven development schemes such as LEADER, sociotechnical infrastructuring is a continuous process that requires the active engagement, appreciative attitude, and proactive stance of local administrators.

**Acknowledgements:** The research was funded by the German Federal Ministry of Food and Agriculture, Federal Office for Agriculture and Food (funding no: 2820FD011).

## References

- Alpine Space. (2022, April 3). *Policy recommendations*. <https://www.alpine-space.eu/project/smartvillages/>
- Atkočiūnienė, V., & Vazonienė, G. (2019). Smart village development principles and driving forces. *European Countryside*, 11(4), 497–516. <https://doi.org/10.2478/euco-2019-0028>
- Bock, B. (2012). Social innovation and sustainability. *Studies in Agricultural Economics*, 114(2), 57–63. <http://dx.doi.org/10.7896/j.1209>
- Bock, B. (2016). Rural marginalisation and the role of social innovation. *Sociologia Ruralis*, 56(5), 552–573. <https://doi.org/10.1111/soru.12119>
- Bosworth, G., Rizzo, F., Marquardt, D., Strijker, D., Haartsen, T., & Thusen, A. (2015). Identifying social innovations in European local rural development initiatives. *Innovation*, 26(4), 442–461. <https://doi.org/10.1080/13511610.2016.1176555>
- Bowker, G., & Star, S. L. (1999). *Sorting things out*. MIT Press.
- Callahan, K. (2007). Citizen participation. *International Journal of Public Administration*, 30(11), 1179–1196. <https://doi.org/10.1080/01900690701225366>
- Callahan, K., & Yang, K. (2005). Training and professional development for civically engaged communities. *The Innovation Journal*, 10(1), 1–16.
- Cambra-Fierro, J. J., & Pérez, L. (2022). (Re)thinking smart in rural contexts. *Growth & Change*, 53(2), 868–889. <https://doi.org/10.1111/grow.12612>
- CARPE DIGEM. (2022). *Territorial Digital Assessment Tool*. <https://carpedigem.eu/?lan=en>
- Certomà, C. (2021). *Digital social innovation*. Springer VS.
- Cowie, P. J., Townsend, L., & Salemink, K. (2020). Smart rural futures. *Journal of Rural Studies*, 79, 169–176. <https://doi.org/10.1016/j.jrurstud.2020.08.042>

- Dargan, L., & Shucksmith, M. (2008). LEADER and innovation. *Sociologia Ruralis*, 48(3), 274–291. <https://doi.org/10.1111/j.1467-9523.2008.00463.x>
- de Viron, C. K., & Mudri, G. (2019). Integrated approach to sustainable EU smart villages policies. In A. Visvizi, M. D. Lytras, & G. Mudri (Eds.), *Smart villages in the EU and beyond* (pp. 13–27). Emerald.
- European Network for Rural Development. (2016). *Cork 2.0 Declaration*. [https://enrd.ec.europa.eu/sites/default/files/cork-declaration\\_en.pdf](https://enrd.ec.europa.eu/sites/default/files/cork-declaration_en.pdf)
- European Network for Rural Development. (2018a). *Smart villages. EU rural review 26*. [https://enrd.ec.europa.eu/sites/default/files/enrd\\_publications/publi-enrd-rr-26-2018-en.pdf](https://enrd.ec.europa.eu/sites/default/files/enrd_publications/publi-enrd-rr-26-2018-en.pdf)
- European Network for Rural Development. (2018b). *How to support smart villages strategies which effectively empower rural communities?* [https://enrd.ec.europa.eu/sites/default/files/enrd\\_publications/smart-villages\\_orientations\\_sv-strategies.pdf](https://enrd.ec.europa.eu/sites/default/files/enrd_publications/smart-villages_orientations_sv-strategies.pdf)
- European Network for Rural Development. (2018c). *LEADER LAG Survey 2017. Findings at European level*. [https://enrd.ec.europa.eu/sites/default/files/leader-resources\\_lag\\_survey\\_results.pdf](https://enrd.ec.europa.eu/sites/default/files/leader-resources_lag_survey_results.pdf)
- European Network for Rural Development. (2022). *LEADER/CLLD*. [https://enrd.ec.europa.eu/leader-clld\\_en](https://enrd.ec.europa.eu/leader-clld_en)
- European Commission. (1999). *European spatial development perspective*. [https://ec.europa.eu/regional\\_policy/sources/docoffic/official/reports/pdf/sum\\_en.pdf](https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf)
- European Commission. (2010). *Europe 2020: A European strategy for smart, sustainable and inclusive growth*. <https://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>
- European Commission. (2017). *EU action for smart villages*. European Commission.
- European Commission. (2020). *Pilot project: Smart Eco-social villages. Final report*. [https://enrd.ec.europa.eu/news-events/news/pilot-project-smart-eco-social-villages-final-report\\_en](https://enrd.ec.europa.eu/news-events/news/pilot-project-smart-eco-social-villages-final-report_en)
- European Commission (2021). *Territorial agenda 2030*. [https://ec.europa.eu/regional\\_policy/sources/docgener/brochure/territorial\\_agenda\\_2030\\_en.pdf](https://ec.europa.eu/regional_policy/sources/docgener/brochure/territorial_agenda_2030_en.pdf)
- European Commission. (2022). *Broadband coverage in Europe in 2021*. <https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2021>
- European Union. (2018). *Rural areas and the primary sector in the EU*. <https://policycommons.net/artifacts/1940245/rural-areas-and-the-primary-sector-in-the-eu-contents/2692014/>
- Fahmi, F. Z., & Arifianto, A. (2022). Digitalization and social innovation in rural areas. *Rural Sociology*, 87(2), 339–369. <https://doi.org/10.1111/ruso.12418>
- Florida, R., Adler, P., & Mellander, C. (2017). The city as innovation machine. *Regional Studies*, 51(1), 86–96. <https://doi.org/10.1080/00343404.2016.1255324>
- Foray, D. (2015). *Smart Specialization. Opportunities and Challenges for Regional Innovation Policy*. Routledge.
- Guzal-Dec, D. (2018). Intelligent development of the countryside. *Economic and Regional Studies*, 11(3), 32–49. <https://doi.org/10.2478/ers-2018-0023>
- Häikiö, J., & Koivumäki, T. (2016). Exploring digital service innovation process through value creation. *Journal of Innovation Management*, 4(2), 96–124. <https://journals.fe.up.pt/index.php/IJMAI/article/view/179>
- Hite, J. (1997). The Thunen model and the new economic geography as a paradigm for rural development policy. *European Review of Agricultural Economics*, 19(2), 230–240.
- Ianiello, M., Iacuzzi, P., Fedele, P., & Brusati, L. (2019). Obstacles and solutions on the ladder of citizen participation. *Public Administration Review*, 21(1), 21–46. <https://doi.org/10.1080/14719037.2018.1438499>
- International Telecommunication Union. (2020). *Building smart villages: A blueprint*. [https://www.itu.int/dms\\_pub/itu-d/opb/str/D-STR-SMART\\_VILLAGE.NIGER-2020-PDF-E.pdf](https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-SMART_VILLAGE.NIGER-2020-PDF-E.pdf)

- Karasti, H. (2014). Infrastructuring in participatory design. *Proceedings of PDC'14*, 1, 141–150. <https://doi.org/10.1145/2661435.2661450>
- King, C., Felty, K., & Susel, B. (1998). The question of participation. *Public Administration Review*, 58(4), 317–326. <https://doi.org/10.2307/977561>
- Komorowski, Ł., & Stanny, M. (2020). Smart villages: Where can they happen? *Land*, 9(5), 151. <https://doi.org/10.3390/land9050151>
- Kühn, M. (2015). Peripheralization: Theoretical concepts explaining socio-spatial inequalities. *European Planning Studies*, 23(2), 367–378. <https://doi.org/10.1080/09654313.2013.862518>
- Matern, A., Binder, J., & Noack, A. (2020). Smart regions: Insights from hybridization and peripheralization research. *European Planning Studies*, 28(10), 2060–2077. <https://doi.org/10.1080/09654313.2019.1703910>
- McCann, P., & Ortega-Argilés, R. (2015). Smart specialization, regional growth and applications to European Union cohesion policy. *Regional Studies*, 49(8), 1291–1302. <https://doi.org/10.1080/00343404.2013.799769>
- Moulaert, F. (2009). Social innovation: Institutionally embedded territorially (re)produced. In D. MacCallum, S. V. Haddock, & F. Moulaert (Eds.), *Social innovation and territorial development* (pp. 11–23). Routledge.
- Müller, S. D., & Skau, S. A. (2015). Success factors influencing implementation of e-government at different stages of maturity. *International Journal of Electronic Governance*, 7(2), 136–170. <https://doi.org/10.1504/IJEG.2015.069495>
- Mulgan, G., & Pulford, L. (2010). *Study on social innovation*. European Union/The Young Foundation. <https://youngfoundation.org/wp-content/uploads/2012/10/Study-on-Social-Innovation-for-the-Bureau-of-European-Policy-Advisors-March-2010.pdf>
- Nalbandian, J. (1999). Facilitating community, enabling democracy. *Public Administration Review*, 59(3), 187–197. <https://doi.org/10.2307/3109948>
- Naldi, L., Nilsson, P., Westlund, H., & Wixe, S. (2015). What is smart rural development? *Journal of Rural Studies*, 40(2015), 90–101. <https://doi.org/10.1016/j.jrurstud.2015.06.006>
- Neumeier, S. (2017). Social innovation in rural development. *The Geographical Journal*, 183(1), 34–46. <https://doi.org/10.1111/geoj.12180>
- Nieto, E., & Brosei, P. (2019). The Role of LEADER in smart villages. In A. Visvizi, M. D. Lytras, & G. Mudri (Eds.), *Smart villages in the EU and beyond* (pp. 63–81). Emerald.
- Noack, A., & Federwisch, T. (2018). Social innovation in rural regions. *Sociologia Ruralis*, 59(1), 92–112. <https://doi.org/10.1111/soru.12216>
- Organisation for Economic Cooperation and Development. (2013). *Rural-urban partnerships. An integrated approach to economic development*. OECD Publishing. <https://doi.org/10.1787/9789264204812-en>
- Park, S., Freeman, J., & Middleton, C. (2019). Intersections between connectivity and digital inclusion in rural communities. *Communication Research and Practice*, 5(2), 139–155. <https://doi.org/10.1080/2041451.2019.1601493>
- Patnaik, S., Siddhartha, S., & Mahmoud, M. S. (Eds.). (2020). *Smart village technology. Concepts and developments*. Springer. <https://doi.org/10.1007/978-3-030-37794-6>
- Philip, L., & Williams, F. (2019). Healthy ageing in smart villages? *European Countryside*, 11(4), 616–633.
- Pollermann, K., Raue, P., & Schnaut, G. (2013). Rural development experiences in Germany. *Studies in Agricultural Economics*, 115(2), 111–117.
- Ravazzoli, E., Götsch, H., & Hoffmann, C. (2018). Smart territorial relationships. In A. Bisello, D. Vettorato, P. Laconte, & S. Costa (Eds.), *Smart and sustainable planning for cities and regions* (pp. 601–613). Emerald.



- Ray, C. (2006). Neo-endogenous rural development in the EU. In P. Cloke, T. Marsden, & P. Mooney (Eds.), *Handbook of rural studies* (pp. 278–291). Sage.
- Salemink, K., & Strijker, D. (2016). Rural broadband initiatives in the Netherlands as a training ground for neo-endogenous development. *Local Economy*, 31(7), 778–794. <https://doi.org/10.1177/0269094216670940>
- Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the Digital Age. *Journal of Rural Studies*, 54, 360–371. <https://doi.org/10.1016/j.jrurstud.2015.09.001>
- Sept, A. (2020). Thinking together digitalization and social innovation in rural areas. *European Countryside*, 12(2), 193–208. <https://doi.org/10.2478/euco-2020-0011>.
- Shucksmith, M. (2010). Disintegrated rural development? Neo-endogenous rural development, planning and place-shaping in diffused power contexts. *Sociologia Ruralis*, 50(1), 1–14. <https://doi.org/10.1111/j.1467-9523.2009.00497.x>
- Slee, B. (2019). Delivering on the concept of smart villages. *European Countryside*, 11(4), 634–650. <https://doi.org/10.2478/euco-2019-0035>
- Star, S. L., & Bowker, G. (2002). How to infrastructure. In L. Lievrouw, & S. Livingstone (Eds.), *The Sage handbook of new media* (pp. 230–245). Sage.
- Stojanova, S., Lentini, G., Niederer, P., Egger, T., Cvar, N., Kos, A., & Stojmenova Duh, E. (2021). Smart villages policies: Past, present and future. *Sustainability*, 13(4), 1–28. <https://doi.org/10.3390/su13041663>
- Terluin, I. J. (2003). Differences in economic development in rural regions of advanced countries. *Journal of Rural Studies*, 19(3), 327–344. [https://doi.org/10.1016/S0743-0167\(02\)00071-2](https://doi.org/10.1016/S0743-0167(02)00071-2)
- Tragos, E., Fragkiadakis, A., Angelakis, V., & Pöhls, H. C. (2017). Designing secure IoT architectures for smart city applications. In V. Angelakis, E. Tragos, H. Pöhls, A. Kapovits, & A. Bassi (Eds.), *Designing, developing, and facilitating smart cities* (pp. 63–87). Springer VS.
- Urban-rural Partnerships (2020, November 26–27). URP2020 documentation: Sustainable & resilient urban-rural partnerships. <https://www.zukunftsstadt-stadtlandplus.de/Termin-Detail/urp2020-documentation-urp2020-sustainable-resilient-urban-rural-partnerships.html>
- Vanolo, A. (2014). Smartmentality: The smart city as disciplinary strategy. *Urban Studies*, 51(5), 883–898. <https://doi.org/10.1177/0042098013494427>
- Visvizi, A., & Lytras, M. D. (2018). It's not a fad: Smart cities and smart villages research in European and global contexts. *Sustainability*, 2018(10), 2727. <https://doi.org/10.3390/su10082727>
- Visvizi, A., Lytras, M. D., & Mudri, G. (Eds.). (2019). *Smart villages in the EU and beyond*. Emerald.
- Wolski, O., & Wójcik, M. (2019). Smart villages revisited. In A. Visvizi, M. D. Lytras, & G. Mudri (Eds.), *Smart villages in the EU and beyond* (pp. 29–48). Emerald.
- Zavratnik, V., Kos, A., & Stojmenova Duh, E. (2018). Smart villages: Comprehensive review of initiatives and practices. *Sustainability*, 10(7), 2559. <https://doi.org/10.3390/su10072559>