



What makes a smart village smart? A review of the literature

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What makes a smart village smart? A review of the literature

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Structured Abstract:

Purpose - Smart villages have lately attracted considerable attention, but what does the term mean? In this paper we review the literature to highlight its ambiguous nature and identify main theoretical and practical aspects to be further explored in the conceptualisation and implementation of these initiatives.

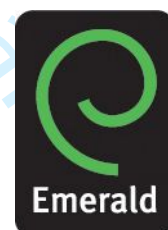
Design/methodology/approach - The analysis draws upon a review of 69 references from the grey and academic literature on smart villages, identified through a systematic search of academic databases and snowball sampling.

Findings - Our review highlights how the definition and characterisation of smart villages is shaped by disciplinary backgrounds and geographical context. Our analysis also demonstrates how smart villages are often viewed as being the opposite of smart cities, with limited engagement in the literature with other debates around rurality, the development of appropriate (digital) skills and the development of smart sustainable initiatives. It is only through engaging with these other debates that a better understanding of the term will emerge.

Originality - This is the first paper to conduct a systematic literature review on smart villages, taking into account multiple disciplinary, technological and geographical contexts. In addition to identifying the main trends in the conceptualisations and design of these initiatives, this paper contributes to the academic debate on smart rural development and provide useful recommendations to both policymakers and practitioners.

Keywords: smart villages; rural development; smart specialisation strategy; digitisation; ICT4D.

Article Classification: Literature review



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1 What makes a smart village smart? A review of the literature

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Abstract

Purpose - Smart villages have lately attracted considerable attention, but what does the term mean? **This literature review explores** its ambiguous nature and identifies main theoretical and practical aspects to be further explored in the conceptualisation and implementation of these initiatives.

Design/methodology/approach – The analysis draws upon a review of 79 references from the grey and academic literature on smart villages, identified through a systematic search of academic databases and snowball sampling.

Findings – Our review highlights how the definition and characterisation of smart villages is **currently** shaped by disciplinary backgrounds and geographical contexts. Smart villages are often viewed as the **rural version** of smart cities **or an innovative model for rural development, but there has been little** engagement in the literature with other debates around rurality **and sustainable development**. It is only through engaging with these other debates that a better understanding of the term will emerge.

Originality – This is the first paper to conduct a systematic review on smart villages. In addition to identifying the main trends in the conceptualisations and design of these initiatives, this paper contributes to the academic debate on smart rural development and provide useful recommendations to both policymakers and practitioners.

Keywords: smart villages; rural development; smart specialisation strategy; digitisation; ICT4D.

1. Introduction

Smart cities (SCs) have been promoted and analysed for more than two decades, smart villages (SVs) only recently have attracted the interest of policymakers and researchers alike. These initiatives are being implemented in both developed and developing countries as part of national and international programmes for rural development (European Commission, 2016; European Commission, 2017; CGIAR, n.d.). Researchers with an engineering or technical background have often contributed to these projects, with the development of smart artefacts purposely designed for rural users (Larsen and Estes, 2019; Ouédraogo et al., 2019). More recently social scientists have also engaged with SVs, focusing on their management and impact upon rural communities (Pělucha, 2020; Despotović, 2020).

To date a variety of case studies have been analysed, highlighting the heterogeneity of models and approaches adopted worldwide for the implementation of these initiatives. Such a heterogeneity arguably reveals the composite nature of SVs, but it also suggests that the concept itself has yet to be clearly delineated (Zavratnik *et al.*, 2018). Therefore, this paper proposes a systematic review of the academic and grey literature with the aim of exploring how the concept and practice of SVs change across different geographic contexts and disciplinary areas. By reviewing the experiences so far analysed in the literature, this paper will clarify the composite nature of SVs and map how this relates to the growing debate on the implementation of smart technologies in non-urban contexts.

With this in mind, the analysis is structured as follows: Section 2 summarises the current debate on the expansion of smart cities (SCs) beyond urban boundaries. Section 3 describes the methodology applied to systematically review the literature, whose

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3 50 findings are presented in Section 4 and discussed in Section 5. Section 6 provides
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5 51 concluding remarks, including recommendations for researchers and policymakers.
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13 **2. Smart cities beyond cities: the state of the art**

14 54 While SCs have been researched for more than two decades (Palomo-Navarro and Navio
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16 55 Marco, 2018), only recently have scholars started to explore whether and how these
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18 56 initiatives can be applied to other geographic contexts. Several constructs – such as those
19
20 57 of ‘smart village’, ‘smart region’, ‘smart territory’ and ‘smart island’ – have been
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22 58 proposed to describe the expansion of SCs models beyond urban boundaries (Gobin-
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24 59 Rahimbux *et al.*, 2020; Sutriadi, 2018; Navio Marco *et al.*, 2020).
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29 60 Consistent with what has been observed in the SC literature (Mora *et al.*, 2017),
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31 61 earlier research on SVs and similar constructs primarily focused on their technological
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33 62 aspects (Somwanshi *et al.*, 2016; Anderson *et al.*, 2017). Later studies have also
34
35 63 investigated how these initiatives can effectively benefit rural communities (Acosta *et al.*,
36
37 64 2021; Philips and Williams; 2019). As noted by Zavratnik *et al.* (2018), most research in
38
39 65 this area remains case-dependant rather than theoretically grounded.
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43 66 In fact, fewer attempts have been made to theorise smart initiatives in a non-urban
44
45 67 context. Cowie *et al.* (2019) framed them as an example of networked rural development,
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47 68 combining exogenous and endogenous actors and resources. Naldi *et al.* (2015), instead,
48
49 69 linked ‘smart rural development’ to the concepts of sustainable development and smart
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51 70 specialisation, a novel paradigm advocating a place-based approach to innovation policies
52
53 71 (McCann and Ortega-Argiles, 2013). Sustainability has also become a central area of
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55 72 inquiry for SCs researchers, which are increasingly advocating the creation of
56
57 73 ‘sustainable smart cities’ (Ahvenniemi *et al.*, 2017).
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3 74 More generally, research on SVs and similar constructs tend to overlook the fact
4
5 75 that the implementation and impact of digital technologies differ widely between rural
6
7 76 and urban areas (Gerli and Whalley, 2021; Freeman and Park, 2015). The need to
8
9 77 overcome these normative biases in the literature on SCs and SVs has been highlighted
10
11 78 by Visvizi and Lytras (2018b), who stressed the importance of analysing these initiatives
12
13 79 in relation to the geographic contexts they are embedded in. Indeed, even those
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15 80 researchers focusing on urban projects are increasingly recognising the influence of the
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17 81 local contexts, highlighting how the implementation of SCs varies between large and
18
19 82 small cities (Lopes and Oliveira, 2017; Sokolov *et al.*, 2019).
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28 84 3. Research methodology

29
30 85 In March 2021, a systematic search of major academic databases was conducted (Gobin-
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32 86 Rahimbux *et al.*, 2020), following the steps detailed in Table 1. Using ‘smart’ and
33
34 87 ‘village’ as keywords, the search returned 156 academic outputs. Of these, 71 references
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36 88 were excluded, because their titles or abstracts did not focus on SVs or were in a language
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38 89 different from English. Once duplications were also eliminated, the search yielded a total
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40 90 of 70 outputs. Of these, 17 were discarded after reading their full text, which described
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42 91 applications for SVs without defining or explaining what SVs are. Snowball sampling,
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44 92 however, led to the inclusion of further 13 academic references. An additional 13
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46 93 references were identified by **repeating** the search in June 2021 and November 2021.
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48 94 Hence, the review covered 79 references in total.
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54 95 NVIVO was used to structure the review of the literature applying eclectic coding,
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56 96 a method for qualitative research that combines different coding methods (Saldana,
57
58 97 2016). **As detailed in Table 2, descriptive coding was employed to categorise explicit and**
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3 98 implicit definitions of SVs as well as the frameworks and quotes describing the
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5 99 components of these initiatives. Both definitions and descriptions were then thematically
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8 100 analysed. Consistent with the review in Section 2, the analysis of the definitions explored
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10 101 how the conceptualisation of SVs relate to the literature on SCs and to existing theories
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12 102 of rural and smart development. It also highlighted two additional themes: the geographic
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14 103 scope of SVs and the meaning of smartness. The analysis of the frameworks and
15
16 104 descriptive quotes led to the identification of five components characterising SVs:
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18 105 technology, human capital, physical resources, services, and governance.
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24 107 **[Insert Table 2 about here]**
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27 28 109 **4. Findings**

29 30 31 110 **4.1 Results of the systematic search of the literature**

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34 111 Overall, 79 references were reviewed, including 41 peer-reviewed articles, 23 conference
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36 112 papers, 13 book chapters, one working paper and one editorial. These were published
37
38 113 between 2010 and 2021. In 57 cases the authors were academics, while 14 references
39
40 114 were authored by representatives of either companies (5), public authorities (4), research
41
42 115 centres (4), or NGOs (1). Eight publications were co-authored by academic and non-
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44 116 academic researchers. Most authors were affiliated to either European (46) or Asian (30)
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46 117 institutions.
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50 118 The reviewed studies were primarily descriptive or conceptual: they presented the
51
52 119 notion of SVs, analysed its implementation, or discussed its potential for rural
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54 120 development. Only 30 works included empirical research, primarily based on qualitative
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56 121 case studies. The latter were mainly located in Poland (11 references), India or Malaysia
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58 122 (3 studies each).
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5 124 **4.2 Explicit definitions of smart villages**

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8 125 As detailed in Table 3, SVs were explicitly defined in nine cases. Three definitions were
9
10 126 coined by international organisations promoting these initiatives: the ENRD, the
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12 127 Consultative Group for International Agricultural Research (CGIAR) and IEEE. Five
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14 128 were developed in academic publications, with the remaining one being proposed by the
15
16 129 representative of a company.
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22 131 **[Insert Table 3 about here]**23
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26 133 The definitions reveal the variety of technological and socio-economic aspects
27
28 134 that SVs can encompass. For example, CGIAR focuses on climate-smart technologies
29
30 135 and agriculture, while IEEE describes SVs as the combination of renewable energy,
31
32 136 community-based education, and entrepreneurial opportunities. The role of communities
33
34 137 and opportunities is central to ENRD's definition, which, perhaps surprisingly, does not
35
36 138 refer to any specific technology. Conversely, academic definitions explicitly link SVs to
37
38 139 the application of ICT and data technologies in a rural environment.
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45 141 Among those works that did not develop their own definition, most used those
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47 142 coined by the ENRD, IEEE and the CGIAR programme. Five scholars referred to the
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49 143 definition by Viswanadham and Vedula (2010), which was the only one coined by
50
51 144 academics to be cited in other works. Some researchers highlighted how the literature still
52
53 145 lacks a unanimous definition of SVs, with the existing conceptualisations being largely
54
55 146 shaped by the heterogeneous contexts wherein these initiatives have been designed and
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57 147 implemented (Komorowsky and Stanny., 2020; Zavriatnik *et al.*, 2020).
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148 4.3 Definitions of village

149 Interestingly, none of the definitions in Table 3 describe what ‘village’ means. In fact,
150 only eight references explicitly addressed what a village is, and the conceptual and
151 geographic boundaries of this term are far from being clear-cut. Slee (2019) and
152 Zavriatnik *et al.* (2020) framed villages as ‘physical communities’ or ‘small settlements’,
153 while Aggarwal *et al.* (2018) and Wollenberg *et al.* (2018) suggested an overlap with
154 local administrative units. Visvizi *et al.* (2019), in contrast, described a village as a
155 microcosm and a community to highlight its difference from other constructs, such as
156 ‘rural areas’ and ‘countryside’, that are seen as de-personalised.

157 Whereas scholars tended to agree on the limited size of villages (Despotovic *et*
158 *al.*, 2020; Zavriatnik *et al.*, 2020), it has been highlighted that the scale of SVs is variable
159 and context-dependant (Aggarwal *et al.*, 2018; Philip and Williams, 2019). Some even
160 suggested that SVs should not be limited to a single village but rather integrate
161 neighbouring communities together (Bielska *et al.*, 2021; Dobrota *et al.*, 2020).

163 4.4. Definitions of smart

164 The term ‘smart’ was explicitly defined in 16 references. In most cases, it was associated
165 with innovation or digital technologies (Pělucha, 2020; Philip and Williams, 2019; Slee,
166 2019). Some authors though contested this view, claiming that SVs do not necessarily
167 require the use of advanced technologies (Shuldiner, 2020; Wolski, 2019), but rather rely
168 on the collective intelligence of rural communities and their collaboration with multiple
169 stakeholders (Zavriatnik *et al.*, 2020; Bielska *et al.*, 2021). Murty and Shankar (2020)
170 concluded that ICT in SVs are solely relevant to the achievement of human development,
171 and, in their perspective, this represents a major difference between SVs and SCs.

172 A relationship between smart and sustainable development was also

1
2
3 173 acknowledged. Adamowicz (2020) and Zavratinik *et al.* (2018) described smart
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5 174 development as a component of sustainable development, explicitly referring to the
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8 175 sustainable development goals set by the United Nations. Chanak and Banerjee (2021)
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10 176 presented smartness and sustainability as interrelated concepts that both contribute to
11
12 177 improving quality of life, equality, and other indicators of socio-economic progress.
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16 17 179 **4.6 The relationship between smart villages and smart cities**

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19 180 The review clearly highlighted how scholars tend to have conflicting views on the
20
21 181 relationship between SCs and SVs. Most viewed the latter as the rural equivalent of SCs
22
23 182 (Mishbah *et al.* 2018; Holmes *et al.*, 2015; Ballina, 2020) or their complement in a rural
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25 183 setting (Dobrota *et al.*, 2020). Others, in contrast, conceived SVs as ontologically distinct
26
27 184 from SCs (Ella *et al.*, 2018; Visvizi and Lytras, 2018a). SVs are described as more
28
29 185 community-oriented than SCs (Budziewicz-Guzlecka, 2019) and less focused on digital
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31 186 technologies (Fennell *et al.*, 2018, Murty *et al.*, 2020). Consistently, SVs and SCs are
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33 187 expected to require different technological solutions and business models (Katara, 2016;
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35 188 Mohanty, 2021).
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40 41 42 190 **4.7 The relationship between smart villages and rural development**

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44 191 Regardless of the technologies involved in SVs, scholars agreed in conceiving them as
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46 192 place-based and bottom-up initiatives (Aggarwal *et al.*, 2018; Fennell *et al.*, 2018). In
47
48 193 both developed and developing countries, their implementation was described as a
49
50 194 territorially-embedded process addressing the needs of a given territory (Bielska *et al.*,
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52 195 2021; Nieto *et al.*, 2019) and leveraging its potential and resources (Srivatsa, 2015;
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54 196 Adamowicz *et al.*, 2021).
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58 197 These concepts are well-established in the theory of endogenous rural
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3 198 development, yet this theory was only explicitly referred to in Guzal-Dec *et al.* (2019);
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5 199 and Malek and Tahir (2017). Slee (2019), instead, linked SVs to the emerging literature
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7 200 on smart specialisation strategies. Overall, the review confirmed that the current
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9 201 conceptualisations of SVs lack a clear and robust theoretical underpinning.
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13 14 203 **4.8 The components of smart villages**

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17 204 The review identified 11 papers developing descriptive frameworks and 22 papers
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19 205 discussing the components of SVs. The analysis of these references led to the
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21 206 identification of five themes (technology, human capital, physical resources, services, and
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23 207 governance), representing the key constituents of these initiatives.
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26 208 Among the technologies, broadband and ICT were emphasised as a prerequisite
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28 209 for the establishment and development of SVs in Europe (Dobrota *et al.* 2020; Doyle *et*
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30 210 *al.*, 2021). The role of ICT was also acknowledged as crucial for the SVs implemented in
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32 211 emerging economies (Ram *et al.*, 2021; Acosta *et al.*, 2021). These initiatives, however,
33
34 212 were described as relying on a broader range of technologies, such as solar panels, water
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36 213 pumps and technologies for climate-smart agriculture (Fennell *et al.*, 2018; Aggarwal *et*
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38 214 *al.*, 2018).
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41
42 215 However, some authors underlined that the opportunities deriving from these
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44 216 technologies can only be leveraged if rural communities have adequate levels of human
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46 217 capital (Mishbah *et al.*, 2018; Santhiyakumari *et al.*; 2016). Consistently education and
47
48 218 knowledge-transfer recurred as key enablers of SVs (Adesipo *et al.*, 2020;; Davidenko *et*
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50 219 *al.*, 2020; Perez del Hoyo, 2019).
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53 220 SVs were also described as relying on physical resources – such as water, land
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55 221 and infrastructures. Their importance was particularly remarked by those researching SVs
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57 222 in developing countries (Viswanadham and Vedula, 2010; Zhang and Zhang, 2020).
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223 Renewable energy, though, was also mentioned as a component of SVs in Europe
224 (Watson, 2019).

225 Similarly, the services that SVs provide differ depending on the context where
226 these initiatives take place. The literature described the SVs implemented in Africa, Asia
227 and Latin America as focusing on advanced practices for agriculture (Adesipo et al., 2020;
228 Aggarwal et al., 2018) and the enhancement of public services such as health and
229 education (Aziiza and Susanto, 2020; Malek and Tahir, 2017). The role of agriculture was
230 debated by European scholars too: according to Pěluha (2020), SVs should go beyond
231 smart agriculture, whose centrality was, instead, defended by Bisaga (2019). However,
232 SVs in Europe were mostly described as providing innovative services (such as smart
233 tourism, e-healthcare and smart mobility), combining ICT with social entrepreneurship
234 (Slee, 2019; Ballina, 2020).

235 With regard to the governance of SVs, the participation of citizens recurred as a
236 distinctive element in both developed and developing countries (Davidenko *et al.*, 2018;
237 Katara, 2016), differentiating these initiatives from SCs (Harakal'ova, 2018). Some
238 scholars also remarked the role played by institutions (Santhiyakumari *et al.*, 2016;
239 Fennell *et al.*, 2018), without explaining what institutions they referred to. Likewise,
240 researchers agreed on the need for policies and strategies to guide the realisation of SVs
241 (Slee, 2019; Aggarwal *et al.*, 2018; Zhang and Zhang, 2020), without clarifying at what
242 level such policies and strategies should be defined.

243

244 **5. Discussion**

245 Our review confirmed that the concept of a 'smart village' remains primarily defined by
246 its practice. As a result, a universal definition or shared conceptualisations of SVs does
247 not exist. Even the nature and scope of these initiatives are unsettled, as the notions of

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3 248 'smart' and 'village' still lack a clear definition.
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5 249 Despite this heterogeneity, two major trends can be recognised in the
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7 250 conceptualisations of SVs. In European debates, they are presented as community-led
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9 251 projects leveraging smart technologies and social entrepreneurship to develop innovative
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11 252 services that are expected to offset the decline of rural communities. In the literature
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13 253 focusing on emerging economies, the role of ICT is less predominant and SVs are seen
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15 254 as leveraging a wider array of technologies and resources to enhance the provision of
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17 255 essential services and innovate traditional economic activities.
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21 256 These different models arguably reflect the heterogeneous levels of infrastructural
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23 257 and institutional development characterising rural communities, but also evoke different
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25 258 visions on rural development. In the European debate, SVs are expected to innovate and
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27 259 regenerate the rural economy by introducing new solutions that may eventually replace
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29 260 existing services. Consistently, they are seen as pioneering new models of rural
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31 261 development, where ICT is leveraged by rural communities to overcome their traditional
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33 262 reliance on agricultural activities and subsidised public services.
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37 263 Conversely, researchers affiliated to Asian, African and Latin-American research
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39 264 institutions describe SVs as empowering rural communities and supporting their
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41 265 sustainable development, by tackling both environmental challenges and social issues
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43 266 within rural regions. In their conceptualisation, SVs are less focused on ICT but rather
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45 267 engage with a wider array of technological, human and natural resources in order to boost
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47 268 rather than replace existing models of rural development.
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51 269 In line with Naldi *et al.* (2015), some European researchers have also recognised
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53 270 a potential overlapping between smart and sustainable development in the context of SVs.
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55 271 Social innovation indeed recurs as a key component of SVs in Europe, but environmental
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57 272 issues are only incidentally mentioned. This highlights a possible gap in the
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3 273 conceptualisation and implementation of SVs in Europe, where the potential of these
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5 274 initiatives for sustainable development seems largely unexplored or, at least, under-
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8 275 researched.

9
10 276 Overall, the review confirms that the term ‘smart’ may assume multiple meanings,
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12 277 reflecting diverging views on the contribution of smart technologies to rural development.
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14 278 Whereas the potential of ICT for SVs is widely recognised, some authors reject a techno-
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17 279 centric view and rather emphasise the importance of human capital. This represents a
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19 280 major difference from the literature on SCs, where ICT is considered as a cornerstone of
20
21 281 smartness (Palomo-Navarro and Navio Marco, 2018).

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24 282 Smartness is not the only ambiguous concept; even the notion of village lacks a
25
26 283 clear definition. This is not surprising. Defining rurality has long proved challenging for
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28 284 researchers, as rural communities and regions differ quite widely from a demographic,
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30 285 spatial and socio-cultural perspective (Halfacree, 2016). These distinctions are also
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32
33 286 relevant in the context of smart rural development; for example, peripheral areas are
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35 287 expected to struggle more than peri-urban areas in exploiting the potential of smart
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37 288 technologies (Naldi *et al.*, 2015). However, the literature on SVs has not engaged with
38
39 289 this debate. In most cases, rural communities are simply conceived as an alternative to
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41 290 cities or their smaller version. Some scholars did remark on the uniqueness and peculiarity
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43 291 of rural needs and problems, but this still contributes to perpetuating a dichotomic view
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45 292 (countryside versus cities) that does not reflect the complexity of rural areas.

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49 293 This review also confirmed that the debate on SVs has mainly focused on whether
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51 294 these initiatives represent an alternative model or are ‘just’ a variant of SCs, without
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53 295 examining the complex relationships that may exist between SCs and SVs (Zavratnik *et*
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55 296 *al.*, 2018). Geographers have recently observed how rural spaces are increasingly
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57 297 enclosed in and connected with urban areas (Bedini and Bronzini, 2016). Future research
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3 298 should further consider these trends to fully capture the complex interplay existing
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5 299 between cities and rural areas in the context of digitisation (Navio Marco *et al.*, 2020).
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7 300 Further attention should also be paid to middle-sized towns that, despite their role for
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9 301 territorial cohesion (European Union, 2007), remains largely overlooked in the current
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11 302 debate on SCs and SVs.
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19 305 **6. Conclusions**

21
22 306 This review has highlighted that, despite its increasing popularity, the concept of SV
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24 307 remains ambiguous, being context-dependant rather than grounded on well-established
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26 308 theoretical constructs. Further research is, therefore, needed to establish a clear theoretical
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28 309 foundation for the conceptualisation of SVs. This will help clarify the scope and nature
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30 310 of SVs as well as their relationship with SCs and other relevant paradigms in regional and
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32 311 innovation studies. Furthermore, additional consideration should be given to the potential
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34 312 overlapping between smart and sustainable development in order to clarify how smartness
35
36 313 affects social and environmental issues in a rural context.
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40 314 From a practical perspective, our analysis helps practitioners and policymakers to
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42 315 identify and experiment with alternative configurations for the design and implementation
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44 316 of SVs. In particular, drawing upon the experiences developed in Africa and Asia, this
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46 317 review invites SVs in Europe to integrate environmental outcomes in their initiatives.
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48 318 This would also maximise their contribution to the EU agenda on the green and digital
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50 319 transitions (Slee, 2021).
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54 320 The review also evidenced the plurality of endogenous and exogenous resources
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56 321 deemed as necessary for the implementation of SVs. Consequently, our paper helps the
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58 322 promoters of these initiatives identify gaps in the resources available at a local level and
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3 323 build partnerships with external actors to complement such gaps. Scholars could facilitate
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5 324 this by conducting additional empirical studies that compare SVs across different
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8 325 geographic settings.

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10 326 Furthermore, this paper calls for further research on the scope for operational and
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12 327 strategic collaborations between SCs and SVs. The two models are predominantly
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14 328 conceived as either complements or alternatives, thereby overlooking the complex
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16 329 relationships existing between cities and their surrounding rural. Overcoming such a
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18 330 dichotomic view is a key priority to redirect research and policy debates towards
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20 331 alternative theoretical and empirical models capable of maximising the potential of smart
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22 332 technologies for local development and territorial cohesion (Navio-Marco *et al.*, 2020).

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26 333 Given the vague nature and boundaries of villages, our analysis reinforces the
27
28 334 importance of coordination and collaboration among rural communities in the
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30 335 implementation of smart initiatives. Not only would this allow to leverage existing and
31
32 336 potential synergies. It would also prevent the emergence of new divides between smart
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34 337 and unsmart villages (Slee, 2019), that could eventually undermine the potential of smart
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36 338 initiatives for rural development and territorial cohesion.

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Transforming Government: People, Process and Policy

Table 1 – Process and output of the systematic literature review

Steps	Description	Output (n. of references)
1) Identification and selection of databases	Webofknowledge, EBSCO, ProQuest	
2) Keywords	TITLE-ABS-KEY (“smart village” OR “smart villages”)	
3) Search	Webofknowledge: <i>116 references</i> EBSCO: <i>16 references</i> ProQuest: <i>24 references</i>	156
4) Review of titles and abstracts	<i>71 references</i> excluded	85
5) Automatic filters	<i>15 duplicates</i> excluded	70
6) Full-text review	<i>17 references</i> excluded	53
7) Snowball	<i>13 references</i> added	66
8) Updated search	<i>13 references</i> added	79

Table 2 – Summary of the coding analysis

Descriptive coding (Number of references)	Thematic coding (Number of codes)
<i>Definitions</i> Explicit (8) Implicit (40)	In relation to rural and smart development (27)
	In relation to SCs (25)
	Meaning of smartness (16)
	Geographic scope (16)
<i>Descriptions</i> Comprehensive frameworks (11) Discussion of single components (22)	Services (43)
	Technology (30)
	Human capital (30)
	Governance (25)
	Natural resources (18)

Table 3 – Definitions of SVs

Source	Definition
ENRD (2018)	Smart villages are rural areas and communities which build on their existing strengths and assets as well as on developing new opportunities
CGIAR (n.d.)	Climate-smart villages are an approach where CCAFS in partnership with rural communities and other stakeholders tests and validates in an integrated manner, several agricultural interventions
Fennell <i>et al.</i> (2018)	The Smart Villages notion proposes as a bottom-up mechanism based on a data-generated understanding of rural aspirations to generate economic growth, create wealth and sizeable demand for rural and agricultural products, thereby enabling the shift from subsistence to a more diversified and sustainable agriculture.
Holmes (2018)	...the “smart village,” a rural analog of the “smart city” concept, in which access to sustainable energy, together with modern information and communication technologies, enables holistic development, including cultural changes in the provision of good education and healthcare; access to clean water, sanitation, and nutrition; and the growth of social and industrial enterprises to boost incomes.
IEEE Smart Village Initiative	IEEE Smart Village has a unique approach to support the world’s energy-impooverished communities by providing a comprehensive solution combining renewable energy, community-based education, and entrepreneurial opportunities.
Pělucha (2020)	...the concept SMART village is more complex and does not only cover the agricultural sector. On the contrary, it is a wider use of the possibilities of the digital economy and relevant types of services, which represents a very heterogeneous group of activities.
Puthal <i>et al.</i> (2021)	A village that uses information and communication technologies for advancing economic and social development to make villages sustainable.
Shuldiner (2018)	I consider the “Smart Village,” a smaller, less-dynamic, and more homogeneous place that may be, in some ways, much smarter than any city.
Viswanadham and Vedula (2010)	We define a smart village as a bundle of services which are delivered to its residents and businesses in an effective and efficient manner.