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The significance of the European Green Deal for implementing the concept of smart villages in the European Union

SUMMARY The aim of this article is to demonstrate the relationship between the objectives of the European Union's (EU) development strategy for 2050, the European Green Deal (EGD), and the concept of smart villages. The research hypothesis assumed that the implementation of the European Green Deal's objectives would contribute to the development of smart villages in the EU. Six components of smart villages were identified: smart economy, smart society, smart environment, smart accessibility, smart governance, and smart agriculture, which were briefly characterized. The article addressed the following research questions: (*i*) what are the main objectives of the EGD? (*ii*) How are smart villages defined? (*iii*) In which areas does the European Green Deal realize the objectives of the concept of the smart village? (*iv*) Which areas of smart villages are most prominently emphasized in the EU's development strategy for 2050? Qualitative research methods were used, and an analysis of the EGD provisions was conducted using a self-prepared questionnaire to assess the implementation of smart villages' objectives. It was demonstrated that the relationships are significant, with different degrees of importance attributed to individual areas. Most interventions were planned in the smart environment and smart economy areas, while intelligent accessibility received the least attention. This study represents the initial part of research into the discussed research problem, which requires further analysis of detailed strategies and legal acts related to the provisions of the European Green Deal.

KEYWORDS smart villages, intelligent villages, European Green Deal, European Union, rural development, climate neutrality, rural development policy

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Introduction

Rural areas are currently facing a series of social, economic, technological, and environmental challenges. These challenges include depopulation, an aging population, lower per capita income than in cities, inadequate access to social and technical infrastructure, climate change, biodiversity loss, digital exclusion, and ensuring food security.

As the European Union's previous approaches to rural development have proven to be ineffective, new concepts are being sought to address the specific challenges of rural areas. At the end of the second decade of the 21st century, the European Commission (EC) established a working group that initiated work on the possibilities of implementing a new rural development concept – smart villages. Its main principles and implementation tools were defined. At the same time, the EC was working on a new long-term development strategy for the European Union, which was announced in 2019 under the name "European Green Deal" (EGD).

In the literature on the subject, the issue of smart villages has been relatively widely discussed (Kalinowski, Komorowski & Rosa, 2021; Komorowski & Stanny, 2020; Ramesh, 2018; Visvisi, Lytras & Mudri, 2019; Wolski, 2018a; Wolski, 2018b; Wójcik, 2018; Zavratnik, Kos & Stojmenova, 2018). Researchers have also addressed the strategic objectives of the EU from the perspective of 2050 (Borkowski, 2021; Ossewaarde & Ossewaarde-Lowtoo, 2020; Pomyłka & Raczyński, 2020; Smolaga, 2021; Wiejski, 2019). However, there is a clear lack of academic studies dedicated to the mutual relations between the assumptions of the smart villages concept and the European Green Deal. The research hypothesis is that the implementation of the European Green Deal's objectives will contribute to the development of smart villages in the EU. Verifying such a hypothesis requires answers to the following research questions: What are the main objectives of the EGD? How are smart villages defined? In which areas does the European Green Deal realize the objectives of the smart villages concept? Which areas of smart villages are most prominently emphasized in the EU's development strategy for 2050? In the research process, the content of documents published by EU institutions was analyzed. Based on a self-prepared survey questionnaire, a comparison was made between the goals/objectives of the EGD and the components previously identified by the author as constituting a smart village.

The European Green Deal

On December 11, 2019, the European Commission announced a long-term vision for the development of the European Union – the European Green Deal, setting goals for the year 2050. It emphasized that the most significant challenges facing the current generation are the warming climate and the transformation of the natural environment, manifested by the devastation of oceans and forests, as well as the increasing number of endangered species (European Commission, 2019, p. 2).

The response to these challenges is expected to involve actions by member states aimed at transformations in the economic, social, and environmental systems. The transformation is intended to lead to the creation of a new, resource-efficient, and competitive economy, a just, properly functioning, healthy society not threatened by the negative effects of environmental changes, and the decoupling of economic growth from the use of natural resources, as well as the protection, preservation, and improvement of natural capital. According to the European Commission, the realization of these goals will be possible if the European economy achieves net-zero greenhouse gas emissions by 2050 (European Commission, 2019, p. 2).

The presented main objectives require actions in several priority areas: climate, energy, agriculture, industry, environment and oceans, transportation, finance, and regional development, as well as research and innovation (European Commission, 2022). Since the publication of the communication on the European Green Deal, the European Commission has progressively published detailed strategies and developed proposals for legal acts to implement its provisions. Among the decisions taken, there are calls for educational activities to increase knowledge about climate warming and the resulting threats, legal commitments of states to reduce emissions under the European Climate Law (Regulation, 2021), a series of investments to improve the energy efficiency of buildings and public facilities, legal protection of 30% of the land and marine areas of member states, allocation of 25% of agricultural land for organic production, and a 50% reduction in pesticide use (Regulation, 2021).

The concept of smart villages

The concept of smart villages originated in the early 21st century in India. In the context of implementing the Europe 2020 strategy, a working group was established to explore the possibilities of implementing the concept in European conditions (Panciszko, 2021b, p. 43). Smart villages were defined by the European Commission as rural areas and communities that use their existing strengths and assets to seek new opportunities. They also align with the principles of a territorial approach, involving the active participation of the local community in decision-making, development strategy formulation, and development process management (European Commission, 2017, p. 3).

Smart villages harness the potential of Information and Communication Technologies (ICT), big data, and the Internet of Things (IoT) to improve the economic, social, and environmental conditions of the local community. ICT, big data, and the Internet of Things offer opportunities to enhance the quality of life for rural residents and can contribute to making rural areas more attractive for living, working, and recreation (European Network for Rural Development, 2019, p. 2). It is noted that smart villages leverage digital and social innovations in many aspects of socio-economic life, including education, health, environmental protection, transportation, industry, agriculture, and energy production (European Network for Rural Development, 2022).

The complexity of the issues and the multi-sectoral nature of the areas that are supposed to create smart villages in the EU led the author to identify six components: smart society, smart economy, smart environment, smart agriculture, smart accessibility, and smart governance (Panciszko, 2021b, p. 44).

Smart society, in the context of smart villages, encompasses an information society, one that possesses the necessary qualifications and skills to use new technologies, especially information and communication technologies. It acquires and processes knowledge in the process of economic management, responding to new challenges and expectations. It exhibits a high level of participation and the creation of social innovations. It is characterized by a low level of social exclusion, discrimination, and poverty. It is a society that protects and cultivates local culture and traditions (Tomczyk, 2010).

The smart economy component encompasses the principles of a knowledge-based economy that leverages the latest discoveries and inventions, driven by knowledge, and fosters technological innovations (Mikulska, 2012, p. 175).

It aims to increase rural income and create new and improved job opportunities, including beyond traditional sectors like agriculture, forestry, and food processing. While implementing new solutions, attention is paid to their real and potential impact on the natural environment, and it advocates for a circular economy.

The third component focuses on smart environment, primarily manifested in the reduction of greenhouse gas emissions into the atmosphere. Biodiversity and traditional rural landscapes are under protection. Actions are taken to limit pollution and practically implement the principles of sustainable development and environmental protection (Lisowska, 2005, pp. 178–208).

Another dimension is smart agriculture, which provides tools for the modern management of agricultural farms and natural resources within them, while simultaneously safeguarding the climate and the environment (Panciszko, 2021b, p. 44). It extensively utilizes digital technologies such as GPS, mapping, remote sensing, and Geographic Information Systems (GIS) (Matuszewki, 2012, pp. 444–447).

Smart accessibility involves creating a wide range of amenities in rural areas to improve the quality of life. This includes enhancing access to technical and social infrastructure, public transportation within the territory, and connections with neighboring entities (Panciszko, 2021b, p. 44). In this context, attention is drawn to creating solutions that facilitate the functioning of dependent individuals, such as people with disabilities, the elderly, those with temporary or permanent mobility limitations, and parents with young children (Sikora-Gaca, 2019, p. 71).

The last component highlighted by the author is smart governance, which involves the engagement of a wide range of stakeholders in the decision-making process regarding the directions of development and public interventions in a given area. It includes the creation of long-term development strategies tailored to local conditions and the use of e-administration, e-participation, and e-management tools (Bolivar & Meijer, 2015, p. 8).

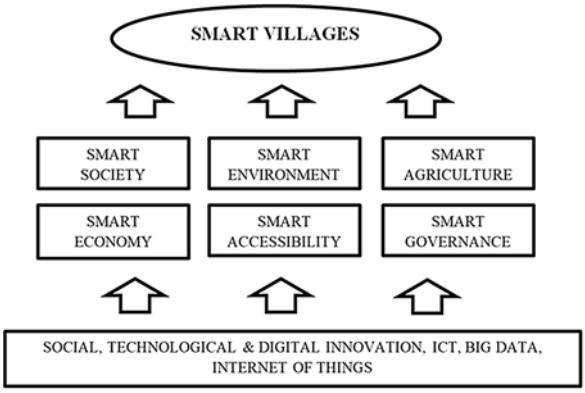

Diagram 1. The concept of smart villages and its components

Source: Own elaboration.

Smart villages vs. European Green Deal – comparative analysis of principles

In this section of the study, we will test whether and how the actions planned for implementation within the European Green Deal can contribute to the implementation of the discussed smart village components. To achieve this, a detailed analysis of the content of the European Commission's communication regarding the European Green Deal (EGD) has been conducted. However, it should be emphasized that many provisions of this document are general in nature, setting the direction for planned changes. Since the publication of the European Commission's communication, work has been ongoing on detailed strategies and legal acts that specify the tools and measures using which the goals outlined in Table 1 can be achieved. The following analysis is therefore an initial exploration of this issue.

The analysis of the data below indicates that the principles of the smart villages concept are reflected in the strategic goals of the EU for 2050. Each of the mentioned components of smart villages has been identified in the provisions of the EGD. However, it should be noted that the strategy unevenly emphasizes their importance. The greatest emphasis has been placed on the smart environment and smart economy. These goals, concerning rural areas, focus on the need to reduce fossil fuel consumption and thus emissions, increase the use of renewable energy sources, protect and restore ecosystems, and adapt

the economy to energy transformation while minimizing the consumption of natural resources and promoting their reuse.

The smart society comprises the planned fight against social exclusion and the declaration of leaving no one behind. According to the author, this declaration is particularly significant in the context of the European economic transformation. Different countries have various energy production systems and use more or less energy-intensive industrial processes.

The success of changes in the agricultural sector is crucial for the implementation of the EGD objectives. Agriculture is a significant greenhouse gas emitter, accounting for approximately 10% of all emissions in 2018 (Mielcarek-Bocheńska & Rzeźnik, 2021). Therefore, changes in food production systems are necessary. The European Commission advocates for an increase in the area of organic farming and a significant reduction in the use of chemicals in agriculture.

Smart governance is reflected in the creation of strategic plans by member states in the energy sector and involving various groups in decision-making processes crucial for the development directions of a given rural area. In the final part of the document, the European Commission also highlights the need to increase citizens' awareness of the consequences of inaction in the field of climate protection.

The document pays little attention to smart accessibility. There is a recognized need to ensure access to energy and protection against energy poverty. However, issues related to the creation of appropriate technical infrastructure in rural areas that contribute to zero-emission are not addressed. In the context of climate-neutral transportation, rural areas face significant challenges due to the lack or low quality of public transportation, which is not adapted to the needs of residents, especially dependent individuals.

Table 1. Goals of the European green deal in the context of smart villages principles

Component	Intervention area	Detailed goals of the European green deal
Smart society	Social Inclusion	A just and prosperous society Transformation ensuring social inclusion "Leaving no one behind"
	Health Protection	Protection of citizens' health and well-being from environmental threats and negative environmental impacts
	Citizen Awareness	Increased citizen awareness of climate change
	Protection of Rights	Ensuring consumer protection and labor rights Implementation of the European Pillar of Social Rights
Smart economy	Economic Growth	Economic growth decoupled from natural resource use
	Competitiveness	Ensuring the competitiveness of the European industry Support for breakthrough technologies Use of digital technologies
	Job Creation	Low-emission technologies as an opportunity to create new jobs
	Natural Resources	Sustainable economy Circular economy Stimulation of the secondary raw materials market Transformation in resource-intensive sectors: steel, textiles, construction, electronics, plastics Exploring opportunities related to the blue economy
	Economic Security	Ensuring supply security
	Energy	Renovation of public and private buildings to reduce energy consumption Incorporation of the impact of transportation on climate and the environment into the price of goods and services Production and introduction of alternative fuels

Component	Intervention area	Detailed goals of the European green deal
Smart environment	Climate	Achieving zero greenhouse gas emissions (greenhouse gases, GHGs) by 2050 Reducing GHG emissions by 55% by 2030 compared to 1990
	Ecosystems	Protection and preservation of natural capital Protection and restoration of ecosystems and biodiversity Increase in the surface area of protected areas Improvement in the quality and expansion of forested areas Restoration of natural groundwater and surface water functions
	Energy	Clean, secure energy Sustainable, smart mobility Mechanism for adjusting prices at external EU borders, taking into account emissions Energy system based on renewable energy sources Phasing out coal Integration and digitization of the European energy system
	Pollution	Zero emissions of pollutants Improvement in air quality
Smart accessibility	Access to Energy	Affordable energy Protection against energy poverty
	Access to Infrastructure	Fair living conditions for farmers and fishermen
Smart agriculture	Food Production	A just, healthy, and environmentally friendly food system Sustainable food production Reduction of pesticide, chemical, and antibiotic use
	Natural resources	Circular economy in the food production sector
	Innovation	Increased use of digital innovations in agriculture
Smart governance	Participation	Participation and engagement of public opinion Organization of a series of social dialogues and citizens' assemblies Cooperation with the private sector Improvement of access to administrative and judicial control at the EU level
	Strategic Planning	Development of sectoral strategies Development of plans by Member States Member States' plans in the field of energy and climate

Source: Own elaboration.

Conclusions

The European Green Deal is a long-term development strategy for the EU, with the main goal of transforming the economies of member states towards zero emissions. This requires significant transformations in existing economic and social systems. Its implementation will also lead to significant changes in the natural environment. According to the European Commission, rural areas should play a key role in the European economic transformation. Although the strategic document only incidentally refers to them, the areas they occupy, the population that inhabits them, and the resources they possess play a significant role in the socio-economic development of the entire group. Achieving climate neutrality, due to the scale of emissions from rural areas, not only from agriculture, forestry, and land use but also from transportation, other sectors of the economy, or individual consumption, is not possible without transformations within them.

The concept of smart villages is a relatively new approach to rural development implemented in the EU, assuming intelligent development of these areas based on their own advantages and opportunities that arise in the environment, especially through the widespread use of modern technologies, especially information and communication technologies. For the purposes of the study, the author identified several components that make up a smart village: smart society, smart economy, smart environment, smart governance, smart accessibility, and smart agriculture.

The analysis of the European Green Deal strategy shows significant dependencies between the ideal assumptions that make up the smart villages concept and the goals planned to be achieved in the EU by 2050. The research hypothesis posed at the beginning is affirmed. Each component is emphasized in different ways, with the most interventions planned in the areas of smart environment and smart economy. The least attention has been paid to smart accessibility.

Further extensive research is needed to analyze the assumptions of detailed strategies, legal acts adopted by the European Commission, and the directions of financial flows for the designated goals.

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Znaczenie Europejskiego Zielonego Ładu dla implementacji koncepcji *smart villages* w Unii Europejskiej

STRESZCZENIE Celem artykułu było wykazanie zależności pomiędzy założeniami strategii rozwoju Unii Europejskiej (UE) do 2050 r. Europejskim Zielonym Ładem (EZŁ) a koncepcją *smart villages*. Hipoteza badawcza zakładała, iż implementacja założeń Europejskiego Zielonego Ładu przyczyni się do budowy *smart villages* w UE. Wyszczególniono sześć komponentów smart *villages: smart economy, smart society, smart environment, smart accessibility, smart governance* oraz *smart agriculture*, które pokrótce scharakteryzowano. W artykule udzielono odpowiedzi

na nastepujące pytania badawcze: Jakie są główne założenia EZŁ? Jak definiowane są *smart villages*? W jakich obszarach Europejski Zielony Ład realizuje założenia koncepcji *smart villages*? oraz Jakie obszary *smart villages* są najwyraźniej akcentowane w ramach strategii rozwoju UE do 2050 r.? Wykorzystano metodę badań jakościowych i w oparciu o samodzielnie przygotowany kwestionariusz dokonano analizy zapisów EZŁ pod kątem realizacji założeń *smart villages*. Wykazano, iż zależności są istotne, jednocześnie poszczególnym obszarom przypisano różny stopień znaczenia. Najwięcej interwencji zaplanowano w obszarze *smart environment* i *smart economy*. Najmniejszą uwagę skierowano na inteligentną dostępność. Opracowanie stanowi wstępną część badań nad poruszanym problemem badawczym, który wymaga rozszerzenia o analizę strategii szczegółowych oraz przyjętych aktów prawnych odnoszących się do zapisów Europejskiego Zielonego Ładu.

SŁOWA KLUCZOWE *smart villages*, inteligentne wioski, Europejski Zielony Ład, Unia Europejska, rozwój obszarów wiejskich, neutralność klimatyczna, polityka rozwoju obszarów wiejskich

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