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NEW DIMENSIONS OF RURAL COMMUNITIES' DEVELOPMENT IN ROMANIA – SMART VILLAGE CONCEPT

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Abstract

Preserving the rural identity by establishing communities that develop through intelligent use of local resources and technology, represent new challenges regarding the increase of the living standard in the rural environment. The development of smart villages supposes, first, economic and social development with a direct impact on the quality of life of the members of the rural community as well as on their expectations in relationship to the actions of the public authorities. In this sense, the ability to meet social, educational, economic and environmental challenges, using the strengths and opportunities of a community, but also the involvement of local authorities, are an integral part of the new concept of Smart Villages. Current paper concentrates on defining this novel concept for the Romanian rural area and highlights the implications of its implementation and oversees the structural availability of resources required for optimal fit. The applicability of the concept results from the fund absorption analysis and its implementation is structured in a multi-stage action proposal. Using the financial performance of past projects through various measures to observe the historical trends and indicate future opportunities and introducing the applicable plan as the main research methods, the smart village emergence in rural Romania could directly impact socio-economic development. As the main results present, the ICT infrastructure is tuned in and ready to support various encouraging projects therefore, the Romanian digital rural society is becoming closer to reality. For the Romanian rural communities to be compliant with the international standards, the smart village approach represents a viable action plan.

Key words*: *s**mart village, rural development, Local Action Group, sustainability, digitalization, EU funds

INTRODUCTION

This specific term was primarily introduced by the European Commission as part of the novel rural development policy through the EU Action for Smart Villages [7] that is focusing on connecting rural Europe, amplifying the existing strengths, assets and opportunities of rural areas and communities. This concept is not pushing a unique general solution that fits all communities but rather one that is socio-geo-economically sensitive based on existing requirements and potentials of a specific territorial strategy [5].

Can the LEADER approach continue to create the conditions for smart and higher investment in rural development programs - NRDPs, cohesion funds or at national public and private level?

Sustainable rural development is the general consideration when it is discussed about development policies at national and European level, emphasizing more often that the recognition of the multiple functions of agriculture in today's society, as well as the vital function of rural space, which guarantees the existence and efficiency of agriculture. In the appreciation of the factors of decision at the EU level, the Romanian villages and communes need revitalization and development through new economic and social flows.

Today's society is undergoing unprecedented changes, both socially, culturally and technologically, which can lead to a redefinition of relationships between people, new technologies, science and creativity.

Communities that create viable villages are those that continue, regardless of context, to learn to perceive, use the benefits of rural areas and promote the values of rural space. Digital technologies and innovations help to

ensure a better quality of life, better public services and a more efficient and economical use of local resources. The links between traditions and the latest technologies allow the creation of new value chains in rural areas.

For almost half of Romania's population, the countryside is simply home - a place where they live, work, raise and educate their children. Romanian rural communities need new jobs, basic services, connectivity and intelligent transport solutions, as well as a climate conductive to entrepreneurship. This means an increased awareness that new types of business models will continue to emerge.

Globalization was expected to increase employment opportunities with a positive impact on labour force from remote rural areas that would migrate to economically growing urban centres [20].

Assisting rural enterprises to better connect, integrate and cooperate with urban businesses are the new challenges that Romanian village residents face with.

The importance of appropriating new technologies in agriculture by farmers will be one of the major criteria in assessing the proposed success.

However, it should not be omitted the problems and provocative factors that affect the Romanian rural population in acquiring new technologies in and out of their agricultural practices. These include the lack of adequate knowledge of new technologies, the small size of farms, lack of investment capital, education, experience in agriculture, land ownership, lack of membership in various agricultural organizations and finally, the use of agricultural inputs.

A new perspective that includes the development of the Romanian rural space is the concept of smart villages. Building communities that use local resources and technology in a smart way, but at the same time preserve their rural identity are key features of this concept. The ability to meet social, economic and environmental challenges, building on the strengths of rural communities, including local authorities, and local opportunities, using innovative solutions, incorporates the concept of smart villages.

The economic and social impact, as well as ensuring the success of the Smart Village initiative on rural communities, will take place only by realizing the need to identify all stakeholders, regardless of social and economic conditions, and the main actors that are an integral part of each rural community. The initiation and implementation of smart village strategies can be based on existing initiatives as well as on support measures already underway.

An important role in this context lies with the local action groups (LAGs), that can directly contribute to the mobilization of locals, to facilitate the exchange of views on the challenges and opportunities that arise in merging the local community to a Smart Village, to support technical studies and pilot projects as well as small-scale investment financing. This can create the conditions for greater investment in rural development programs, cohesion funds or at national public and private level.

As a starting point, the authors of this paper view smart villages to advance human development, moreover, they analyse quality of life indicators and technological infrastructure as key factors that represent the structural base for smart village development.

For the Romanian rural communities, the coverage or accessibility of digital technology will not be the main barrier in the development of the Smart Village concept, but rather the low level of qualification, the size of farms, the high percentage of rural aging and its conservatism.

Particular attention will need to be paid to the digital growth and literacy of the rural population.

The major role in the economic development of the villages by outlining the profile of the local economy and identifying future directions of development is played by the local public administration.

The management of human, financial, material and information resources through which they can support local / regional entrepreneurship is the responsibility of local authorities. The development of smart villages can only be achieved by developing an economic dimension and implicitly by

developing new jobs, reducing unemployment, increasing the purchasing power of the local population, increasing revenues from local taxes and fees, reducing the number of social aids granted and, at the same time, improving living conditions [21, 5].

The administrative dimension (governance) comprises three areas covering public services, transparency and policy.

In Romania, institutional transparency is regulated by Law 52/2003, which includes the provisions of European legislation. The administrative dimension also includes the extremely important, even decisive, role that the mayor plays in creating the Smart Village [13].

The mayor is the main decision-maker in almost all issues regarding the implementation of strategies that lead the community to achieve Smart Village, including links with other institutions. As a manager and community leader, he or she should encourage community interaction through the direct participation of community members in making decisions about strategies and policies applied at the community level to achieve Smart Village.

To present the economic dimension in relation to the concept of smart village, the community should group a series of productive economic activities, services, as well as elements of infrastructure. The basic objective of the economic dimension is to remove obstacles in the development process of the local economy and to improve the mechanisms for the efficient functioning of the market.

Other objectives are to focus efforts on assisting the existing business sector, encouraging the opening of new businesses by identifying new people's needs, attracting local investment and raising the level of infrastructure development. To achieve these objectives, it is necessary to operate strictly in the directions of economic development of the respective local community, having as perspectives the economic growth and the improvement of the quality of life of the inhabitants of the given territory.

The adjacent economic dimension of a smart village includes: the integration of economic processes with those on environmental protection, the development of trade and industry, alternatives on financing development as well as behavioral changes of community members.

The quality of the services provided and the degree of social satisfaction that they manage to determine are two of the main indicators of the smart village concept. The growing importance of services in the economy and their spectacular diversification in recent times have broadened concerns for knowledge of this sector of activity, as well as the impact generated in rural areas.

An extremely important role in creating the necessary premises for the transition to the level of economic and social development that characterizes a Smart Village is played by the information and communication technology (ICT), due to the fact that the Smart Village is a management concept that to achieve its objectives is based on the extensive and efficient use of technology information and communications to maximize results. In the construction process of a Smart Village, ICT directly contributes to the local development of business, the improvement of human resources, the growth of the potential of the community, etc.

In order to be applied at the level of small communities, ICT must be affordable, efficient, sustainable, easy to use and maintain. Using ICT can ensure the optimal use of resources, which can contribute to the sustainable development of villages. The technological dimension must also cover the characteristic requirements of the rural environment. Technologies like sensor-based sensors specific to agriculture, animal husbandry, etc., as well as the possibility of creating remote server networks that can store, manage and process data (cloud computing).

There are already many IoT (Internet of Things) applications in agriculture. IoT means the operation of physical devices that have network connectivity via the Internet, which allows the collection and exchange of data between each other. IoT is a huge opportunity

for farmers to monitor their crops and increase productivity.

Satellites, drones, wireless sensor networks, agricultural analytical device systems, farm management systems, big data (long-term statistical series) applied to the farm and the food management chain are all examples of IoT and smart agriculture that is collecting data on temperature, precipitation, humidity, wind speed, pest infestation and soil content.

This data can be used to automate agricultural techniques, make informed decisions to improve quality and quantity, minimize risk and waste, and reduce the effort required to manage crops.

For example, farmers can now monitor soil temperature and moisture remotely and apply precision fertilization based on IoT data [28].

Human resources are key to creating a Smart Village and that is why the education of community members requires special attention.

A qualified human resource can directly influence the attraction of capital and economic organizations that can create added value in the local economy.

Development of services at the local community level, both essential for health and education, and those that can contribute to the development of entrepreneurship, such as infrastructure (transport, energy, water, etc.) and the logistics part that aims to combine factors of production and distribution (raw materials, materials, installations, people, information, etc.) can significantly contribute to ensuring the conditions that allow the achievement of a smart village.

The standard of living in a smart village is related to the living conditions that this paper oversees.

Smart villages are an approach to the local development of the village, which reflects the contemporary dynamics and direction of development processes and the challenges of civilization [2].

Based on the elements analyzed, it can be concluded that this concept, Smart Village, was developed to provide solutions to the many problems faced by localities in rural areas, both economically and socially.

In this context, the purpose of the paper is to highlight the full potential and opportunities resulted from effective conceptual adaptation in the Romanian rural side.

MATERIALS AND METHODS

Several quantitative approaches have been considered in this present paper in order to reveal the importance of the novel smart village concept in Romania.

The first research method is the analytical review of the financial measures of implementation through diverse measures, axes and sub-measures;

Second, a three-staged proposal of applicable action plan for autochthonous actors followed by a quantitative analysis for the existing rural smart infrastructure that represents the structural applicability base.

The smart village model involves rural development that fully utilizes the Information and communications technology to achieve rural sustainable development through proper clarification of rural needs and characteristics.

The smart village focus is on enhancing strategic systems through regulated controls, guides and subsystems that drives digital economic and social transformation and improves local infrastructure enabling rural areas potential of sustainable developing [28].

The participatory approach is reflected through meeting the need to develop a holistic strategy at the local level, focusing on technological innovation (digitization), on social innovation, on local communities rather than at local administrative unit level all of them creating added value to local communities.

The main branches of the implementation of the Smart Village concept for rural communities are described in Table 1.

They are including: public administration sector and administrative services, technology (internet access, technologies specific to the rural environment, etc.), resources (natural economic and human resources), healthy services, standard of living, environmental changes, social, historical, cultural and religious particularities, tourist potential, etc.

Table 1. Smart village implementation initiative

Administration	**Efficiency of administrative services**	**Technology**	**Socio-historical, cultural and religious peculiarities**
Transparency of financial and government information Leadership Improvement Policy(s) Public Services	Use of ICT to provide services to the community;	ICT – Internet access IT infrastructure Technologies specific to the rural environment Sensor used in agriculture and animal husbandry Cloud computing IOT	Tourist potential Village identity Tourist destinations Local brand Village promotion platform Village culture and traditions
Public Services	**Standard of Living** **Safety and effort**	**Resources**	
Economic services Entrepreneurship Access to work Economic institutions Logistic facilities	Waste management Environmental protection Public safety Disaster management Access to public services Sports field Green facilities Banks/Banking services Road and bridge infrastructure	Natural resources – State of the land, access to running water, energy supply Economic resources Agriculture, fishing, animal farms Human resources Rural communications Education level Openness to new Essential services: health services, education services	

Source: Authors' conceptualization.

RESULTS AND DISCUSSIONS

National Rural Development Program (NRDP) contribution to the Smart Village concept implementation

Discussing the implementation of NRDP in our country, we can look at some examples of specific measures that have supported and continue to support the development of a smart village strategy.

Since the 2007-2013 programming period, Ministry of Agriculture and rural Development (MARD) [14] has used part of the amount available under Measure 322: "Renovation, development of villages, improvement of basic services for the economy and rural population and enhancement of rural heritage", from NRDP, allocated through the European Economic Recovery Plan, amounting of approximately EUR 20.38 million, to make the necessary investments for the development of broadband infrastructure in rural areas that had not previously benefited from access to such infrastructure.

This was achieved by implementing sub-measure 322e): "Investments in broadband infrastructure in rural areas". Sub-measure 322e) supported investment in rural areas in the creation or modernization of the last mile access segment of fixed-point electronic broadband networks and the creation or modernization of the backhaul of broadband electronic communications networks, where this segment does not exist or does not fit into broadband parameters. Regarding the technical and financial implementation of this sub-measure, we specify the fact that 12 financing contracts were concluded, with payments amounting up to EUR 1.6 million, of which 9 contracts were finalized.

Also, in the period 2007-2013 [16], it was implemented Measure 125: "Improvement and development of infrastructure related to the development and adaptation of agriculture and forestry". The aim was to adapt the agricultural and forestry infrastructure to the new property structures that have emerged as a result of the property restitution process in order to increase the competitiveness of the agricultural and forestry sector. For the public beneficiaries of this measure, the public aid (EAFRD + national public contribution) was 100%. Under measure 125, a total of 673 financing contracts were concluded with a value of EUR 527 million [1, 22].

For the period 2014-2020, through NRDP [17], a series of public utility measures were implemented, respectively, Sub-measure 4.3 "Investments for the development, modernization and adaptation of agricultural and forestry infrastructure", Sub-measure 7.2 "Investments in the creation and modernization of basic infrastructure at small scale and Sub-measure 7.6 "Investments associated with the protection of cultural heritage". Regarding the contracts concluded related to sub-measure 4.3 to date, there are 1,403 contracts with a total allocated value of EUR 677.7 million, the payments made so far reaching EUR 431.7 million. sM 7.2, has concluded 1,403 contracts, with a total

allocated value of EUR 1.1 billion, the payments made so far being EUR 887.58 million. For sM 7.6, 699 projects were contracted, with a total allocated value of EUR 206.28 million, the payments made so far being EUR 144.44 million [1, 10].
Through the specific "bottom-up" approach, the implementation of the LEADER tool in Romania has led to important results in many rural areas and could play a significant role in helping the rural environment to adapt to contemporary realities that are constantly changing. LEADER [15] has played a significant role in encouraging joint initiatives in rural areas by discovering new solutions to traditional problems. The very creation of LAGs can be considered an innovative element that supports the phenomenon of local governance [5, 26, 24].
In Romania, the NRDP 2014-2020 continues to use the LEADER instrument, as an independent measure with an allocation of over EUR 560 million, representing 7% of the total value of the program.
During this period, 239 local development strategies were selected, implemented by LAGs, with an almost total coverage of the eligible territory (over 92%).
Within the strategies, based on the needs identified at local level, a series of measures have been proposed aimed at local economic and social development, focusing on areas of interest especially in rural areas, such as: promoting local products by adhering to producers' schemes European quality, encouraging association, supporting young people, the issue of vulnerable groups [15].
As a novelty factor, during this programming period, a complementarity mechanism was established between NRDP and POCU to solve rural social problems.
LEADER funding provides the infrastructure part, and the POCU provides social, educational and health services to vulnerable groups in the LAG territories [25].
It can be observed that this mechanism has a character of social innovation, through the 163 projects that received funding worth over EUR 11 million, it contributes to solving the social problems in the local communities.
LEADER has also paid special attention to digitization issues.
Broadband infrastructure has a relative presence in rural areas, and people and institutions do not have the technical support and knowledge to use IT technology.
The LAGs made it possible to finance 28 projects, with a value of over EUR 655 thousand, which aim at setting up a broadband network, the acquisition of IT&C equipment, the development of e-government solutions and digital literacy actions [18].
The elements of social innovation and digitalization in the context of specific cooperation LEADER creates the right framework for the development of "smart villages". ”Smart villages are essentially about people - they are about rural communities taking initiatives to find practical solutions to problems and trying to take full advantage of new opportunities.
Digital solutions can support many of these new opportunities, but smart also means cooperation and the development of new alliances - free thinking and paving the way for prosperity and sustainability. Phil Hogan, European Commissioner for Agriculture and Rural Development” [5].
The strategic documents of the future Common Agricultural Policy and Cohesion Policy indicate that the LEADER approach and support for smart village-specific elements will continue to be funded in the next programming period.

New models regarding the implementation of the concept of smart villages in Romania

Table 2. Stage 1 – Implementation action plan

STAGE 1	***Actions planned***
Training Social Abilities	Identify the main actors in each community; Workshops and actions on motivating the inhabitants of the rural area; Digital literacy Change of mentality Awareness of the importance of implementing Smart Villages initiatives; New opportunities offered by direct contact of the inhabitants of a community with experts in order to gain the best possible understanding.
Periods: Weekly / monthly for different groups, depending on age / education, social level, etc.	

Source: Authors' conceptualization.

Table 3. Stage 2 – Implementation action plan

STAGE 2	***Actions planned***
Development Smart Villages	Identification of social and political organizations, identification of support measures for the development of rural and agricultural infrastructure, logistics, information technology (ICT), telecommunications services linking businesses to other communities, including urban environment, resources, etc. Continuation of the workshops from Stage 1, of the planned actions, by including the following topics: 1. Education 2. Social (presentation of examples of good practices on the standard of living of certain developed rural communities) 3. SMEs 4. Community welfare 5. Promoting and marketing local products / ideas for arranging local markets and supplying them 6. New employment opportunities 7. Interconnected rural communities **Building participation and the role of key actors and stakeholders** 1. Government Agencies and Local Public Authorities 2. Farmers' communities (cooperatives, producer groups, associations, agricultural and non-agricultural enterprises, etc.) 3. Schools and other educational institutions 4. Hospitals and other public health institutions 5. SMEs, Banking Services 6. Community agencies and programs implemented in local community development 7. Social and political organization
Results: Development of new expertise and new references Training of rural residents through workshops and later, development of local communities in the network based on communication through internet technology.	

Source: Authors' conceptualization.

Table 4. Stage 3 – Implementation action plan

STAGE 3	***Actions planned***
Socio-economic impact Abilities	% increase in the promotion and awareness of citizens % increase in production and marketing of local products Increasing social e-inclusion activities Communication Network Development New established ICT industries and mobile entrepreneurs

Source: Authors' conceptualization.

The ways of identifying the main actors in each community on the one hand, as well as identifying all stakeholders, on the other hand, ensure the success of the concept of Smart Villages in Romanian agriculture.

These issues are extremely important, because not all the actors of rural communities, are prepared to be part of this new initiative for a number of reasons, namely, on the one hand, because they are not involved in agriculture and related activities, age, low motivation, disinterest due to very low digital literacy of the rural population.

However, in as far as, more time is devoted to implementing all smart villages initiatives, changing the mindset and attitude that is necessary for all communities means ensuring that all kinds of projects and incentives are attracted, they will be well received and successful.

The implementation of these initiatives can be staged in three time periods, as shown in Tables 2, 3 and 4.

Romanian rural digital society

The Romanian information society faces several essential problems but is also characterized by a good level of training of specialists in the field. We will be able to develop the regions if we create national and regional development networks, virtual organizations of different levels and in different branches of activity [4].

The study on "Implementation of Digital Governance in Romania", conducted by PricewaterhouseCoopers Management Consultants SRL in 2018, shows that Romania is among the last countries in the rankings, ranked 67th out of 193, according to the UN study, but last in the countries EU Member States, ranked 28th out of 28, according to the DESI report, and ranked 54th out of 63, according to the IMD World report, being the penultimate place among EU member states [23].

In 2014, some of the objectives set by the first digital agenda for Europe 2010-2020 were taken over and adapted to the Romanian context. The purpose of this strategy was to ensure the development of Romania's ICT at the level of the other member states and to establish the premises for Romania's

integration, from the ICT point of view, in the digital single market of Europe [8].

Regarding this initiative of our country, most of the measures taken have not been started, the rest being in an early stage of implementation.

The efficiency, effectiveness and quality of services provided by healthcare systems can be greatly improved through digitization. The concrete digital economy is one in which businesses can take full advantage of the possibilities and benefits of digital technologies, both to improve efficiency and productivity, and to achieve sales and reach end customers.

An important aspect in the development of the digital economy is the "quality of economic data" - which is important for building an economic information infrastructure, especially in a changing environment [3].

The 2020 Country Report for Romania, according to Pillar II, PNRR Digital Transformation [19], shows that the digitalization of the economy has lagged, although efforts have been made in this regard. Public services lag those in other EU member states, even though Romania has one of the highest shares of e-government users (7th place in the EU). In addition, in terms of digital technology integration, Romanian companies are well below the EU average.

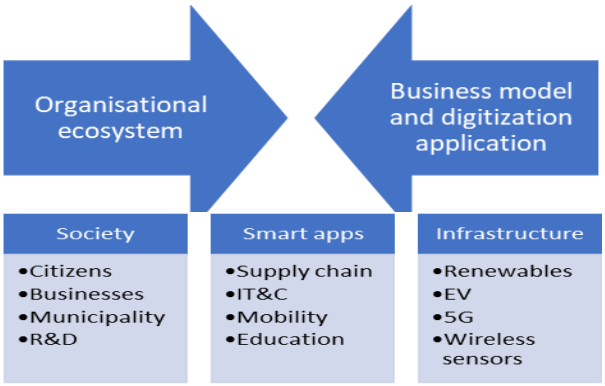

Fig. 1. Digital ecosystem for a smart village
Source: Adapted from [12].

The digital ecosystem required for a smart village highlighted at Figure 1 is pointing out the relevant types of digital service present in rural areas and presents how the pillars of societal well-being can become smart through finetuning of the organisational ecosystem enhancing actors from the civil society, services providers and infrastructure through technological advance.

The digitalization can be achieved at all levels and the immediate effects can improve the rural communities' quality of life.

Romania ranks last Member State in the 2021 ranking of Digital Economy and Society Index as presented in the figure below. On human capital, Romania ranks 26th, Romania ranks 7th on Connectivity thanks to broadband services and this strength could be used to further diminish urban-rural digital divide fully supporting Smart Village implementation (Figure 2).

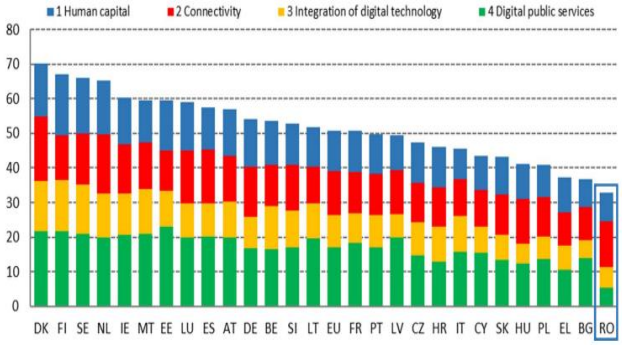

Fig. 2. Digital economy and Society Index (DESI) 2021 ranking
Source: European Commission, Digital Economy and Society Index (DESI) 2021 – Romania [6].

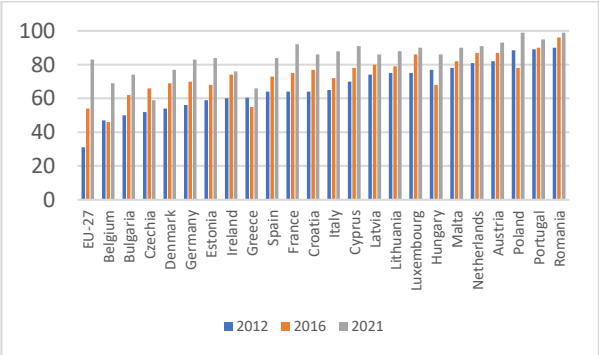

Fig. 3. Last internet use in the past 12 months as % of individuals living in rural areas
Source: Eurostat, Digital society statistics at regional level [9, 11].

Romania ranks among the top 5 countries in internet usage in the last 12 months of rural citizens, reaching almost 100% in 2021 (99%) indicating that rural population is interested in accessing the Web with a growth of 10% in 2021 compared to 2012; the EU-27 average marks a 168% increase in 2021 compared to

2012. This internet accessing ease could represent real opportunities for information access of rural citizens (Figure 3).

While Romania marks last in rural individuals that have never used the internet in 2012, in 2021 it sits on the 21st position with an 76% decrease in 2021 compared to 2012 reaching 16% of the rural population never accessing the internet, similar to the EU-27 average. Such a significant improvement marks rural broadband expansion and general public increased interest in using internet (Figure 4).

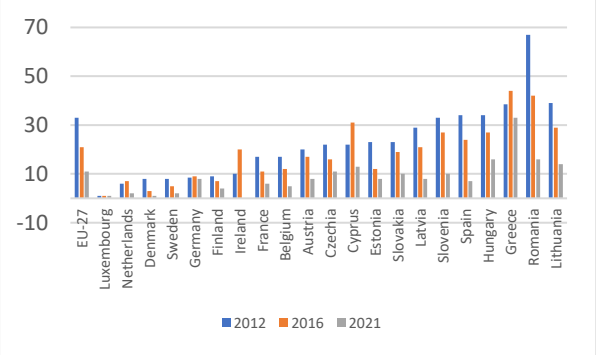

Fig. 4. Percentage of individuals in rural areas that have never used the internet

Source: Eurostat, Digital society statistics at regional level [9, 11].

CONCLUSIONS

The implementation of the Smart Villages initiative in Romania through the 3 stages presented is closely related to the social capacity, the development of eco-systems regarding smart villages and the economic capacity of each rural community. If we refer to the main barriers that could hinder the development of an action plan on the concept of Smart Villages in our country, these would be the large number of small farms, limited knowledge of the use of innovative technologies and techniques and conservatism of the rural population.

The sustainable rural development of a community to be multifunctional must be in line with local conditions, so it will be different depending on the region and the potential of the area. Focus on development and new mechanisms of change will lead to economic revitalization of rural areas.

All actions to implement a smart village should be taken over by both local organizations and residents of a community, to build relationships between partners, using modern ICT.

In a vibrant, European Romania, the strategies will have to be designed in such a way that they no longer meet the "needs of yesterday". Agriculture, in the next programming period, needs strategies to meet future needs, so that the challenges and risks, or the vulnerabilities that may arise, have concrete measures of intervention and correction. Thus, the investment schemes in the new National Strategic Plan will be directed towards the performance and economic viability of the investment, this leading step by step to the road leading to the Smart Villages also in our country.

Moreover, in order to comply with European standards, the Smart Village concept in Romania should focus on how digitalization supports the efficiency and performance at the farm level. Strategic advice on digitalization and e-infrastructure is needed, as it is linked to knowledge exchange, communication, dissemination and operation.

Further, the LAG's that implements the Local Development Strategies, can support the concept of "Smart Villages", which involves the development of smart projects aimed at capitalizing on the knowledge of local communities.

The concept of "Smart Villages" must be translated into strategies that integrate social, economic, health aspects and propose tools to improve local governance. The Local Development Strategies implemented by the LAGs create the optimal framework for the coordinated implementation of Smart Villages type interventions and provide funding opportunities for them. Through the LAG's, it can be identified solutions using technology and innovation, to improve the quality of life in rural areas, in the field of depopulation and demographic handicaps, improving the quality of local services in the field of health and safety of citizens, and the digitalization of social/administrative/educational sectors. [34, 25, 26].

The advantages of implementing Smart Villages through LAGs are that they consider the needs of the community and the potential for local development and, finally, create links between public authorities, the business community and civil society acting at the local level.

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