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SMART RURAL DEVELOPMENT - EDUCATION FOR THE 2030 AGENDA IN RURAL SMART EDUCATIONAL CENTERS

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Abstract

The article explores the concept of intelligent villages as a model of sustainable rural development, with a special emphasis on the role of Smart educational centers in reducing educational inequalities, poverty, limited access to technology, as well as in ensuring food security and reducing rural-urban migration. Smart educational centers combine modern infrastructure, digital tools, and sustainability principles to increase the quality of education, improve agricultural productivity, and strengthen local economic opportunities, thus supporting young people in their communities.The research is based on an analysis of the specialized literature, a contextual evaluation of the rural-urban discrepancies in Romania, and the elaboration of a conceptual framework for the implementation of Smart educational centers. There is a methodological note regarding the comparative selection of three relevant international models (Estonia, Finland, India), as well as a case study applied from Ciugud commune, which illustrates the practical feasibility and the potential for replicating the proposed model. The results highlight the transforming potential of education in rural areas by reducing economic inequalities, increasing food security, and strengthening socio-economic resilience. Although there are challenges related to financing and infrastructure, the article identifies public-private partnerships, continuous training of teachers, and digital inclusion strategies as essential for the success of these initiatives. The implementation of SMART educational centers can contribute significantly to achieving sustainable development objectives, especially in the fields of quality education, poverty eradication, food, decent work, the action for climate, and the development of sustainable communities. These centers can become strategic pillars in the process of sustainable transformation of villages in Romania and can offer valuable models for other countries in similar situations.

Key words**:** *smart villages, education for sustainability, smart educational centers, SDGs, smart rural development*

INTRODUCTION

The idea of smart villages emerged in response to the pressing needs of rural communities, which are facing educational, economic and social challenges. This model proposes an integrated approach to rural development, which includes modern technologies and sustainable practices (Marin Ilie et al., 2022) [12]. Smart villages are designed as future solutions for rural areas, promoting innovation, collaboration between local actors and alignment with the international strategic directions established by the 2030 Agenda for Sustainable Development. (Adamowicz &Zwolińska-Ligaj, 2020; Alabdali et al., 2023) [1, 2].

Education is a key element in achieving the Sustainable Development Goals, especially SDG 4: Quality Education, which promotes equal access to inclusive, equitable and quality education for all. In rural areas, this goal is often affected by major deficiencies in educational infrastructure, limited access to teaching resources and reduced opportunities for students, as well as the phenomenon of youth migration to urban areas in search of better development conditions. At the same time, education in rural areas needs adaptations to respond to other SDGs, such as SDG 8:

Decent work and economic growth, SDG 11: Sustainable cities and communities, and SDG 13: Climate action. (del Arco et al., 2021) [5].

This article explores the potential of quality education in Romanian rural areas, integrated into the Smart Village concept, and proposes the creation of an innovative educational framework that responds to current challenges. By promoting educational centers based on smart principles, the aim is to develop an educational model oriented towards technology, sustainability and global connectivity, but with strong local roots. In Romania, these centers could be the core of a fundamental transformation in rural education, placing a special emphasis on practical skills, education for sustainability, and community collaboration (Firoiu et al., 2019; Brezuleanu et al., 2024) [8, 3].

The proposed educational programs in Romania should be aligned with the goals of SDG 4, including, for example, access to digital resources, practical courses on sustainability and modern agriculture, as well as environmental awareness activities. (Mihai &Iatu, 2020) [13].

At the same time, they should contribute to the achievement of SDG 8, by supporting young people in developing the skills needed to access decent work opportunities in their communities. Also, through education focused on environmental protection and resource efficiency, these initiatives can also respond to the goals of SDG 13. (Grosseck et al., 2020, Ianoş et al., 2021) [10, 11].

The study provides an in-depth perspective on how education, when supported by innovative Smart Village initiatives, can become a decisive factor in the revitalization of rural communities. The proposed educational centers are designed as central elements of this process, facilitating the transition towards a sustainable rural development model, characterized by social equity and increased capacity to adapt to the challenges of the future.

The present paper brings an original contribution by proposing a conceptual educational framework integrated into smart rural development strategies, with a focus on achieving the Sustainable Development Goals (SDGs), in particular SDG 4, SDG 1 and SDG 2. In addition, by including a methodological note justifying the comparative international selection (Estonia, Finland, India) and by presenting a relevant case study from Romania (Ciugud Commune), the paper offers a practical vision of the real possibilities of implementing the concept. This approach responds to the requirement to bring applicative and contextualized value to the analysis of rural education.

MATERIALS AND METHODS

Methodological note-Justification of the comparative international selection

To contextualize the challenges and opportunities of rural education in Romania, a comparative approach was applied, by analysing three relevant international models: Estonia, Finland and India. These countries have not been chosen at random, but based in clear strategic criteria:

1. Estonia – is an European leader in digital education, with a entire digitized system in the rural areas. Estonia is a reference point for Romania, due the demographic similarities, its EU membership and efficient use of the EU funds for the rural digital infrastructure.
2. Finland – was selected for its excellence in education recognized at the global level and for its equitable policies, especially in assuring the access to education of quality in the disadvantaged zones. Finland i an example of good practice regarding the formation of teaching staff and reduction of the urban-rural inequalities.
3. India – was included as an example of a developing country which implemented digital educational solutions and having smart educational centers in complex rural areas. India offers valuable lessons about the implementation on a large scale of the accessible technologies and community formation.

These countries reflect three complementary prospects:

- Estonia –digital transformation in an EU small-sized country;
- Finland – pedagogical quality and educational equity in the rural areas;

- India – innovation and extend in the rural development of the emergent economies.

The analysis is on the topic and illustrative, and not a statistical one, aiming to identify good practices and transferable ideas, not achieving a rigorous benchmarking,

Despite that there are utilize identical indicators for a systematic comparison, the selection of the countries is methodologically grounded and thematically aligned to the objectives of the paper.

Smart Village Educational Centers are proposed as innovative solutions to achieve the Sustainable Development Goals, with a focus on combating poverty, reducing hunger and ensuring access to quality education in rural areas. These centers are designed as essential infrastructures, combining education, technology and sustainability principles, offering tailored responses to the specific needs of rural communities.

-*Review of the specialized literature*

An analysis of international and national literature was conducted to identify examples of good practices and educational solutions implemented in rural environments.

Relevant studies were assessed to understand how quality education (SDG 4) can facilitate poverty reduction (SDG 1) and ensure food security (SDG 2).

-*Comparative analysis*

The challenges facing rural areas in Romania were compared with those in other European and global states, emphasizing limited access to education, digital resources, and professional training opportunities.

Data from reports from the United Nations, UNESCO, and other organizations were analyzed to understand how smart educational centers can contribute to reducing the gaps between urban and rural areas.

-*Defining a conceptual framework for smart educational centers*

The proposed educational centers are designed as hubs integrated into Smart Villages, offering:

-Access to modern technology, namely computers, high-speed internet, and digital tools.

- Educational programs aligned with the Sustainable Development Goals (SDGs), focused on practical skills in sustainability, modern agriculture and rural entrepreneurship.

- Community support through partnerships between local authorities, the private sector and NGOs.

- *Aligning smart educational centers with the priorities of the 2030 Agenda (SDGs)*

According to the proposed conceptual framework, the education offered in these centers must become a catalyst for rural development, integrating the principles of SDG 4 (Quality Education) and at the same time addressing objectives such as poverty reduction (SDG 1), ensuring food security (SDG 2), stimulating economic growth (SDG 8) and protecting the environment (SDG 13).

The educational programs proposed within the smart centers are designed in accordance with the Sustainable Development Goals (SDGs), providing students and learners with practical skills in essential areas such as sustainability, modern agriculture and rural entrepreneurship.

These centers rely on community support, through active collaborations between local administration, the private sector and non-governmental organizations, to support the educational process. The conceptual framework of these centers is based on the idea that education must be the engine of rural development, directly integrating the principles of SDG 4 (Quality Education) and responding to broader needs, such as poverty reduction (SDG 1), food security (SDG 2), economic growth (SDG 8) and environmental protection (SDG 13).

-*Analysis tools and methods*

The study used qualitative methods, such as case study analysis and secondary data processing, to assess the potential of smart educational centers in the context of smart villages. Statistical reports and evaluations of educational policies in Romania were analyzed in order to highlight existing gaps and to substantiate the proposals formulated in the paper. The applied methodology provides a coherent framework for the evaluation and development of smart educational centers, considered sustainable solutions for the transformation of the rural environment, with education at the center of Smart Village initiatives.

RESULTS AND DISCUSSIONS

Access to quality education in rural areas (SDG 4)

In Romania, one of the most persistent challenges of the education system is represented by the major differences between the urban and rural areas. These discrepancies are the result of a combination of factors, such as the insufficiently developed educational infrastructure, the shortage of qualified teachers and the economic difficulties faced by families in rural areas. The school dropout rate in rural areas has reached 24%, compared to 15.6% at the national level and 9.6% at the European Union level, which reflects not only the lack of access to quality education, but also the impact of socio-economic problems (European Commission, 2023) [7].

An aggravating factor is the long distances that students have to travel daily to get to school, which clearly discourages participation in classes, especially in the case of those in middle and high school. Also, limited access to technology and digital resources accentuates this inequality: less than half of rural schools benefit from digital equipment and smart laboratories (European Commission, 2023) [7], which seriously limits the possibilities for digital learning and the application of modern teaching methods.

In comparison, in urban areas, the percentage of schools with functional internet is significantly higher, approaching 95%.

Table 1. Distribution of access to digital education in rural vs. urban areas in 2023

Indicator	Rural (%)	Urban (%)	Difference (%)
Internet access	45	95	50
Specialized IT teachers	20	70	50
Computers per student	0.3	1.2	0.9

Source: European Commission, 2023; National Institute of Statistics Romania, 2023[7, 15].

This gap is also reflected in the use of technology by students: in rural areas, only 0.3 computers are available per student on average, while in urban areas the ratio is 1.2 computers per student (Table 1).

These figures illustrate not only the insufficiency of the digital infrastructure, but also a significant difference in the quality of the educational act.

The shortage of qualified teachers in rural areas also exacerbates this inequality. Recent data shows that only 20% of teachers in rural schools are specialized in using technology in the educational process, compared to 70% in urban areas (Figure 1).

This limits the ability of schools in rural areas to integrate digital education into the curriculum, preventing students from developing essential skills for the modern labor market.

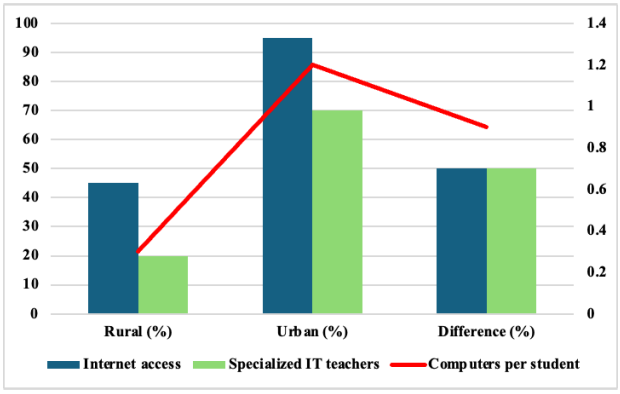

Fig. 1. Disparities in digital education between rural and urban schools in Romaniain 2023

Source: by authors based on the data fromEuropean Commission, 2023; National Institute of Statistics Romania, 2023 [7, 15].

These problems are compounded by the difficult economic conditions of many rural families, who cannot afford to support the costs associated with education, such as the purchase of textbooks, electronic devices, or even the transportation of children to school. In this context, the educational gap between rural and urban areas not only persists but tends to widen in the absence of structured interventions (Firoiu et al., 2019) [8].

The integration of smart educational centers in rural areas can be a viable solution to reduce these disparities. These centers could provide free access to the internet, computers, interactive whiteboards and other digital resources, while supporting teacher training in the use of technology in the teaching process. By addressing these basic issues, smart educational centers could fundamentally transform the educational act in rural areas, providing equal opportunities for education and contributing to reducing the gaps between

rural and urban areas.

By comparison, in Estonia, a global leader in digitalization, all rural schools are connected to high-speed internet, and every student has access to personal devices. (World Bank, 2024)[26].This was made possible by an ambitious government program, supported by European funds. Similarly, in Finland, rural education programs include digital training sessions for teachers, which has contributed to increasing academic performance by 30% in disadvantaged areas (World Bank, 2024) [26].

Therefore, the educational disparities between rural and urban areas in Romania can be reduced by creating smart educational centers, integrated into the concept of Smart Villages. These centers represent a viable solution to provide modern digital infrastructure and educational opportunities that meet the needs of students and teachers in rural areas.

An essential first step is to equip these centers with state-of-the-art technological resources. Free access to high-speed internet would allow students and teachers to use online educational platforms, access interactive materials and participate in virtual lessons. In addition, IT laboratories, equipped with computers, interactive whiteboards and other modern devices, would create an attractive and efficient learning environment. This infrastructure would transform educational centers into multifunctional hubs, capable of supporting both formal education and technology-based extracurricular activities.

Another essential aspect is teacher training. The integration of technology into the educational process depends largely on the skills of teachers. Therefore, training programs would be needed to provide rural teachers with practical skills in using digital tools and integrating them into teaching activities. These programs could include in-service training courses, mentoring sessions and access to e-learning platforms, where teachers can share their experiences and learn from each other.

The establishment of these smart educational centers should start with pilot projects in priority regions, where educational gaps are most acute. The centers could be used not only for teaching, but also for innovative extracurricular activities, such as robotics workshops, programming or the use of drones in agriculture. These activities would encourage creativity and the development of practical skills of students, better preparing them for the challenges of the future.

Dobrota et al (2020) affirmed that initiative actions are useful for sustaining the smart development of rural areas [6].

Tita et al. (2018) designed a model of smart economy and education related to environment based on system dynamics principles [24].

The impact of implementing these centers would be significant. They would contribute to reducing the educational gap between rural and urban areas, increasing the school retention rate and improving the quality of education.

Moreover, through access to modern resources and adequate training, students would have the chance to develop essential digital skills, thus increasing their chances of integration into the labor market.

At the same time, these centers would become reference points for the community, providing spaces for collaboration and continuous learning for students and adults.

By equipping them with modern technology, training teachers and integrating innovative activities, the smart educational centers in Smart Villages could represent a fundamental change for rural education in Romania.

They would not only ensure better access to quality education but would also contribute to reducing inequalities and the sustainable development of rural communities.

Sasu et al (2024) sustain that LEADER intervention offers a financial support for sustaining projects destined to the development of smart villages [20].

Reducing poverty and increasing incomes (SDG 1)

In Romania, important economic and social discrepancies are visible among the urban areas and the rural ones (Popescu et al., 2018) [19].

According to data provided by the World Bank (World Bank, 2024) and the National Institute of Statistics (2023), education has a direct and significant impact on individual incomes in Romania.

Young people from rural areas who have completed high school earn an average

monthly income of 500 euro, while those from urban areas, with the same level of education, earn approximately 800 euro. People without formal education earn about 300 euro in rural areas, compared to 500 euro in urban areas(Table 2).

Table 2. Impact of education on average monthly income in 2023

Education Level	Rural Average Income (€)	Urban Average Income (€)
No studies	300	500
High school studies	500	800
Higher education	800	1,200

Source: National Institute of Statistics Romania, 2023 [15].
Note: National Bank of Romania, Exchange rate: Euro 1 = Lei 4.9773.

These percentage differences — 66.67% in favor of urban areas, regardless of education level — highlight the major economic gap between the two environments. Even for people with higher education, urban salaries are two-thirds higher than rural ones. These figures indicate a clear relationship between educational level and income, but also an unequal distribution of economic opportunities across Romania. (World Bank, 2024; National Institute of Statistics Romania, 2023) [25, 26]
Average income per household is higher in the rural areas than in the rural ones as found by Popescu et. al (2019) [18].
The percentage differences between rural and urban areas reveal that people without formal education earn, on average, 66.67% more in urban areas than in rural areas. Similarly, high school graduates in urban areas have incomes that are 66.67% higher than their rural counterparts. In addition, people with higher education in urban areas earn, on average, 66.67% more than those with the same level of education in rural areas.
These figures emphasize the persistent economic disparity between rural and urban areas.
Although higher education levels contribute to income growth in both contexts, the financial benefits of completing tertiary education are not sufficient to reduce the income gap.
The fact that across all education categories, urban incomes are consistently 66.67% higher suggests not only a greater availability of well-paying jobs in cities, but also a potential lack of economic opportunities in rural areas (Figure 2).

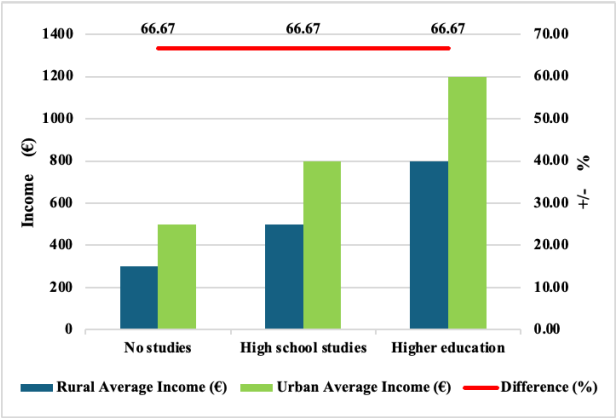

Fig. 2. Romania's disparities in average income between rural and urban areas by education level in 2023
Source: by authors based on the data fromNational Institute of Statistics Romania, 2023 [15].

In Vietnam, educational programs for rural youth increased household incomes by 20% through technical and entrepreneurial training, while in Kenya, integrated rural education initiatives reduced extreme poverty rates by 15% in a decade (Nguyen et al., 2019; Saidi et al. 2024) [16, 19].
Therefore, smart educational centers can contribute to increasing the level of education and implicitly to reducing poverty. They should offer courses in practical skills, such as the use of green technologies and entrepreneurial management.

Contribution to Food Security (SDG 2)

In rural areas of Romania, agriculture is the main source of income for most households, but productivity remains far below potential due to the lack of modern knowledge and advanced technologies. This situation is exacerbated by post-harvest losses, estimated at around 20%, compared to only 5% in developed countries, according to FAO (2023) [9]. These losses are caused by the lack of storage infrastructure, inadequate crop handling, and traditional practices that are not optimized for efficiency.
Smart education, delivered through smart education centers within Smart Villages, could directly address these challenges. These

centers, equipped with modern technologies and digital educational resources, would allow rural farmers to access up-to-date information on sustainable agricultural practices, tailored to the specific needs of their communities. Through interactive courses, hands-on workshops, and access to digital platforms, farmers could learn innovative methods to reduce losses and maximize productivity.

For example, within these centers, farmers could participate in training sessions on the use of drones to monitor crop health, advanced irrigation systems that optimize water use, or modern storage and packaging techniques that reduce crop degradation. Access to digital simulators could also allow farmers to virtually test different planting and harvesting scenarios, thus evaluating the impact of sustainable practices on production.

A similar model has been successfully implemented in India, where farmers in rural areas benefited from training through digital community centers. As a result, post-harvest losses were reduced by 50% and productivity increased by 30% (Sudheer et al., 2021; Sengupta et al., 2024) [23, 21]. Such an impact could be replicated in Romania, adapting the curriculum of smart centers to the specifics of local agriculture.

Table 3. Agricultural productivity before and after farmer training in India (pilot example)

Indicator	Before training	After training	Growth (%)
Cereal production (kg/ha)	3,000	4,000	33
Post-harvest losses (%)	20	10	-50

Source: Sudheer et al., 2021; Sengupta et al., 2024 [23, 21].

In addition to directly training farmers, smart education centers could also engage young people in rural communities, providing them with skills that will transform them into local innovators. They could learn about precision agriculture, the use of artificial intelligence for crop management, or even digital marketing methods for selling agricultural products on national and international markets.

By reducing post-harvest losses and increasing crop yields, smart education in these centers would contribute not only to the economic development of rural households but also to ensuring food security.

A good example of smart communities are the villages dealing with agro-tourism in Sibiu County (Moise et. al, 2023), [14] and also the Ciugud Commune, Alba County, the only community which received the award "The Best Smart Village Project" at the end of the year 2020 for the development of a creative-intelligent community by the implementation of digitization in the local administration, education, local economy and environment protection [4].

In addition, by promoting sustainable agriculture, these initiatives would support SDGs, such as SDG 2: Zero Hunger and SDG 13: Climate Action, creating a more prosperous and climate-resilient rural environment.

Thus, smart education offered through educational centers in Smart Villages represents not only a solution to current agricultural problems, but also an opportunity to transform Romanian agriculture into a sustainable and innovative.

-*Challenges and limitations*

While smart education centers have transformative potential for rural development in Romania, their implementation faces significant challenges that need to be addressed to ensure long-term sustainability. Establishing these centers is an ambitious initiative that requires well-structured solutions and collaboration between key stakeholders.

Funding for infrastructure and educational programs remains a major barrier. Equipping the centers with modern technology, IT labs, high-speed internet, and interactive tools requires substantial investments, often exceeding local budgets. In addition, training and attracting qualified staff requires ongoing financial support. Without consistent funding, these initiatives risk remaining isolated pilot projects with limited impact on rural communities in Romania.

Another challenge is the low level of awareness among rural communities about the long-term benefits of smart education centers. Some communities may perceive these centers as too ambitious a change or as an initiative that is not suitable for their immediate needs.

This skepticism is often fueled by a lack of prior access to the technology or limited experiences with similar projects. In the absence of ongoing dialogue with community members and their active involvement in the decision-making process, the implementation of these centers may encounter resistance.

The lack of qualified human resources is another major barrier in Romania.In rural areas, the shortage of teachers well-trained in the use of modern technologies is a recurring problem. Many teachers in rural areas have not had access to continuous training, and the migration of teachers to urban areas exacerbates this shortage. This lack of qualified personnel can hinder the integration of technology into the educational process, thus reducing the efficiency of smart educational centers.

-Proposed solutions

Reducing the obstacles that hinder the development of smart educational centers in rural areas requires the adoption of coherent solutions, which bring together institutional support and private initiative. An efficient collaboration model can be created by the active involvement of the business environment, together with local and central authorities, in supporting educational infrastructure. Public investments can thus be complemented by resources from the private sector, especially from companies interested in training young people as future employees. IT companies can contribute by providing modern technologies, and those in agriculture or industry can facilitate access to practical internships and specialized training. The success of these initiatives depends on the formalization of partnerships through transparent agreements, which clearly define the obligations of each actor involved and ensure the continuity of long-term interventions.

Mentoring programs dedicated to teachers in rural areas represent a promising direction of intervention. Experienced teachers, whether from urban centers or from other European regions or countries, can be involved in directly supporting local teachers, through practical training sessions and personalized counseling. Activities can include thematic workshops, exchanges of good practices and digital platforms through which a constant professional dialogue can be maintained. The use of online learning platforms facilitates teachers in remote areas' access to modern educational resources and updated pedagogical methods. These digital tools contribute to reducing the professional training gap between urban and rural teachers, offering them opportunities for self-training, virtual collaboration and participation in interactive courses tailored to their real needs.

In addition to mentoring, it is important to provide financial and professional incentives for teachers who choose to work in rural areas. Subsidies, performance bonuses, or priority access to professional development programs could attract more qualified teachers to rural areas.

Organizing local public information and consultation campaigns can play a key role in changing rural communities' perceptions of the usefulness of smart education centers. These efforts should focus on long-term benefits, such as improved access to quality education, increased employment opportunities, and local economic development. Involving local leaders, teachers, and parents in the decision-making process helps build community trust and support for these initiatives.

These measures, if integrated into a coherent national strategy, could transform smart educational centers into a central element of rural development in Romania, contributing both to reducing educational inequalities and to increasing the resilience of rural communities.

Case study - Smart Educational Strategy in Ciugud commune, Romania

Ciugud commune, located in Alba County, has become a model recognized at the national level of intelligent rural development, being awarded with the distinction "Best Smart Village project" at the Smart City Awards Gala in 2020 (Ciugud City Hall, 2021) [4]. This success is the result of a coherent local strategy, which combines innovation, digitization and involvement of the community, having as central pillar the education and retention of young people in the rural area.

One of the most important elements of the transformation in Ciugud was the investment in the educational digital infrastructure. The local administration equipped the school in the commune with interactive tables, tablets for students and high-speed internet connection. Thus, the school has become a digital educational hub, allowing students from rural environments to access a learning environment comparable to urban areas. The teachers benefited from specialized training in the use of digital tools, ensuring

Thus not only the presence of technology, but also its effective integration in the educational process.

Another essential aspect is the involvement of the local community and the private sector. Ciugud City Hall has concluded partnerships with IT companies and educational NGOs, which offered digital resources, training modules and mentoring for teachers and students. These partnerships have also expanded beyond the classroom, through extracurricular activities such as programming workshops, robotics clubs and competitions on topics of green technologies (Ciugud City Hall, 2021) [4].

In terms of durability, the school in Ciugud integrated environmental education into the curriculum, students being actively involved in

Table 4. Educational differences between Ciugud Commune versus the normal schools in Romania

Indicator	Ciugud's school	Average rural school (2023)
Internet access in all classrooms	100%	~ 45%
Number of digital devices per student	1 device/ student	0.3 devices/
Teachers trained in digital pedagogy	80%	student
Partnerships with private sector	Yes	20%
Education for environment integrated into curriculum	Yes (applied projects)	rare
Smart extracurricular activities	Weekly	Sporadic

Sources: Ciugud City Hall (2021) [4]; European Commission (2023) [7].

Recycling campaigns, energy saving projects and climate change awareness. These initiatives directly contribute to the achievement of the SDG 13 Sustainable Development objective: Action for climate and cultivate a civic responsibility for protecting the local environment (Ciugud City Hall, 2021) [4]. Table 4 synthesizes the main educational differences between Ciugud commune and ordinary rural schools in Romania.

This case study shows that a clear local vision, supported by targeted investments and external partnerships, can lead to significant progress in rural education. The replicability of the Ciugud model depends on: the will of the local authorities to adopt Smart Village strategies; access to financing mechanisms (eg Leader, PNRR); the existence of an involved teaching body; support of community and private actors. In the context of this work, Ciugud represents an example of good practice, which offers empirical support for the proposed conceptual model. It shows that Smart educational centers are not only a theoretical construct, but practical and efficient solutions for rural development, when implementing strategies are adapted to local realities.

CONCLUSIONS

The implementation of smart educational centers within Smart Villages represents a viable and innovative solution for combating educational inequalities, reducing poverty and promoting sustainable development in rural areas. These centers are not just spaces dedicated to learning, but multifunctional hubs that integrate modern technology, quality education and community support, becoming catalysts for social and economic change under the environment protection against various climate phenomena (Stojanova et al., 2021) [22].

One of the most important advantages of smart educational centers is their ability to provide access to digital resources and educational programs that are traditionally limited in rural areas. By equipping them with high-speed internet, IT labs, and interactive equipment, these centers provide students and teachers with the tools they need to bridge the gap with urban areas. At the same time, by training teachers and integrating technology into the

educational process, the centers contribute to improving the quality of teaching and developing digital skills, essential for the future of the labor market (UNDP, 2023; World Bank, 2024) [25, 26].

For Romania, another key role of these centers is combating poverty and enhancing food security across the entire food chain, including crop and animal production. By training farmers in sustainable agricultural practices, precision farming, and modern livestock management, smart educational centers help reduce post-harvest and post-production losses, optimize resource use, and improve overall productivity. These initiatives increase rural incomes, strengthen local and regional food supply chains, and enhance economic resilience, ultimately contributing to a more sustainable agri-food system and reducing migration to urban areas.

In addition, the smart education offered in these centers supports the achievement of the SDGs, in particular SDG 4: Quality Education, SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 8: Decent Work and Economic Growth, and SDG 13: Climate Action. By taking an integrated approach to these goals, smart education centers become an example of good practices for sustainable rural transformation.

However, the successful implementation of smart education centers depends on overcoming key challenges, such as securing financing, raising awareness in rural communities, and attracting qualified personnel. Public-private partnerships, mentoring programs for teachers, and community engagement are essential to ensure their sustainability.

In the long term, these centers can radically transform rural Romania, serving as hubs for formal education, vocational training, local collaboration, and innovation. By expanding access to quality education and promoting sustainability, they contribute to a more prosperous, resilient, and globally connected rural environment.

More than just a response to current challenges in rural areas, smart education centers represent a strategic investment in Romania's sustainable development. They can transform rural communities into models of resilience and innovation, reducing socio-economic disparities, and fostering a more equitable and inclusive society. Future policies should integrate these centers into national rural development strategies, ensuring sustainable funding, teacher training, and investments in digital infrastructure to reduce educational disparities and boost economic opportunities. Incorporating them into long-term rural development frameworks would allow Romania to become a regional leader in innovative and sustainable educational solutions.

In addition, the article offers a strategic direction for the formulation of coherent educational and rural policies, based on innovation, sustainability, and digital inclusion. The case study on Ciugud demonstrates the feasibility of implementing such a model and its potential for replication in other rural communities in Romania. Thus, the contribution of the work consists not only in the analysis of an emerging concept, but also in offering a concrete, contextualized and anchored solution in good practices.

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