



Legislative Changes and School Network Restructuring. The Case of Mountainous and Marginal Areas in Mureş County, Romania

Florin POP¹, Stefan DEZSI^{*2}, Andreea Maria CRĂCIUN¹, Judith NYULAS¹, Dorin-Mihai CENGHER³

** Corresponding author*


¹Babeş-Bolyai University, Faculty of Geography, Doctoral School of Geography, Cluj-Napoca, ROMANIA

²Babeş-Bolyai University, Faculty of Geography, Department of Human Geography and Tourism, Centre for Research on Settlements and Urbanism, Cluj-Napoca, ROMANIA

³"Ioan Petruş" Theoretical High School, Otopeni, ROMANIA

✉ eflorinpop@yahoo.com  0000-0001-9627-7810

✉ stefan.dezsi@ubbcluj.ro  0000-0002-8191-2110

✉ craciun_andreea_maria@yahoo.com  0000-0002-2430-344X

✉ judit.nyulas@ubbcluj.ro  0000-0003-4864-756X

✉ mihaicengher@yahoo.com  0009-0001-2287-0125

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ABSTRACT

Ensuring sustainable prospects for young people is an essential condition for the national social and economic development, while education plays a central role in this process by forming the skills necessary for a dynamic and competitive society. The aim of the study is to assess the impact of legislative changes and public policies on access to education by analysing the evolution of school network and school population in the mountainous and marginal area of Mureş County, during the period 1992–2023. Data series related to the number of educational units and the school population were extracted from National Institute of Statistics (NIS). Linear and polynomial regression models were used to highlight evolutionary trends, as well as ARIMA (Autoregressive Integrated Moving Average) models to make a forecast of the school population until 2030. A qualitative analysis of the relevant legislative framework and educational policies for the reference period was performed. Results indicate a sharp decrease in the number of educational units in rural areas, correlated with demographic decline and administrative restructuring processes, but also an increase in pressure on urban educational infrastructure, manifested by the overcrowding of schools. These trends contribute to the escalation of inequalities between rural and urban areas in terms of access to education. Statistical forecasts suggest that the downward trend in the number of school population will continue until 2030, with major implications for the school network planning. The comparative analysis with Romanian neighbouring countries shows that the national situation is closely related to the Bulgarian model, characterized by a high degree of school agglomeration, while Poland and Hungary have applied more balanced rationalization strategies. Conclusions emphasize the need to develop public policies that would advance the economic efficiency of school network reorganization, as well as the principle of equity in access to education, especially for rural communities, in order to strengthen social cohesion and the sustainable development of human capital.

1. INTRODUCTION

In the context of demographic and socioeconomic transformations in Romania and the wider Eastern European region, education plays a decisive role in shaping health, productivity, and social cohesion. It represents a fundamental resource for developing population quality and human capital (Becker, 1993; Sen, 1999), influencing both a nation's demographic prospects and its capacity to adapt to economic, technological, and cultural change. It is not only the duration of schooling that matters, but especially the competencies acquired, the ways in which education reduces inequalities, and its ability to adapt to the transformations of the global knowledge-based economy (Hanushek and Woessmann, 2021). For sustainable and harmonious demographic development, Sen (1999) argues that education expands both individual and collective freedom, enhancing the population's chances of living healthy and productive lives. Education brings advantages both to the individual and to society. At present, educational institutions represent an essential factor in the process of social formation, contributing decisively to the economic, social, and personal development. The educational process fosters the development of physical abilities and is closely linked to the growth of knowledge and skills, competences that have a direct effect on individual progress (OECD, 2006; Schultz, 1987). At the same time, education stimulates civic participation and strengthens social relationships. Overall, involvement in educational activities plays a fundamental role in each person's trajectory of growth and advancement (Feinstein and Hammond, 2004). Investments in education and human development are crucial forms of human capital that stimulate productivity and economic growth, being considered essential factors influencing the evolution of human capital (Schultz, 1961). This approach is primarily economic in nature, yet having direct relevance for the quality of population.

For approximately three decades, Romania has faced a severe demographic decline (Ghețău, 2007; Manea, 2021), characterized by falling birth rates, massive external and internal migration, and accelerated population ageing, demographic phenomena which is also specific to the study area (Crăciun et al., 2022). Subsequently, a drastic decrease in the number of school population was noted, especially in rural areas, where numerous schools recorded a reduced number of enrolled students. Hence, rural areas are affected by depopulation, thus facing restricted access to quality education and amplifying educational disparities (Muntele et al., 2020). Simultaneously, according to PISA 2022 reports, the Romanian educational system records modest performances at the international level, where

Romanian students rank below the OECD average in all assessed domains (OECD, 2023). This dual pressure, demographic and educational, raises essential questions about the capacity of the Romanian society to sustain long-term economic and social development, a capacity that determines the sustainability of communities.

In scientific literature, the national school network is most often found examined in relation to demographic dynamics, educational policies, and equitable access to education. These academic approaches emphasize that the school network has been profoundly influenced by post-1990 changes, particularly by demographic decline and migration (Mărginean, 2016; Țăruș et al., 2021).

Education and educational reforms have been addressed by numerous studies at the national level examining key issues such as educational inequalities, access to schooling, policy reforms, and the role of education in socioeconomic development (Bonea, 2019; Mărginean, 2009; Mihalache, 2020; Muntele et al., 2020; Neagu, 2015; Țoc, 2018; Suvac, 2018; Ștefănescu, 2020; Voicu and Marian, 2010), yet without integrating a detailed spatial analysis of school network transformations in correlation with demographic dynamics and the local socioeconomic context.

In this context, the school network underwent a transition from a dispersed structure to a more consolidated one. This process involved merging schools with small student populations into larger institutions with legal status, typically one per administrative-territorial unit (ATU) in rural areas and several in urban areas. Rural educational units are increasingly closing or being restructured into multifunctional institutions that provide simultaneous education across multiple levels. This administrative restructuring, often driven by demographic decline and resource limitations, has contributed to the emergence of so-called "educational deserts" in isolated rural areas. These deserts are characterized by the reduced availability of proximate schooling options, especially at the middle school level, which leads to longer commuting distances for students and consequently restricts their access to quality education. This phenomenon highlights significant spatial inequalities in educational provision, posing challenges for territorial cohesion and social inclusion in rural communities. All these, despite the legislative intention to enhance quality, which generated stricter quality standards and economic efficiency of the school network. Consequently, if in rural areas the school represented the "heart" of the settlement, fulfilling, in addition to the sine qua non educational role, the main social functions of the community (formal, informal meetings or cultural events, were eliminated through the reorganization of the school network (Buza, 2024).

Recent legislative changes have established a stricter and more procedural framework for

restructuring the school network, particularly the updates to the Education Law, the Pre-University Education Law, and new ministerial procedures and orders regarding the determination of enrolment figures and the reorganization of the school network (Law no. 1/2011 and subsequent amendments, Law no. 198/2023, OMEC Order 5599/2020, Order 5197/2025). The implementation of these changes seeks to optimize expenditures and adapt to demographic decline. However, both academic literature and policy reports highlight significant risks for students in mountainous and marginal areas, including greater distances, higher transportation costs, and potential decreases in school participation, as well as uncertainties regarding the impact on educational quality (Ares Abalde, 2014; Echazarra and Radinger, 2019; Hannum, et al, 2021; OECD, 2018). Thus, recent legislation emphasizes school transportation and after-school programs, which are intended to facilitate the consolidation of educational institutions. However, in practice, these measures have often resulted in the closure of local schools, particularly in rural areas, contributing to reduced accessibility and, in some cases, accelerating the depopulation of nearby communities. Consequently, legislative changes acted as an administrative response to the demographic crisis, but produced unintended effects of spatial reconfiguration (e.g., abandonment, inequity) due to the lack of adequate related measures (infrastructure, transport, social support).

In international studies, the school network is conceptualized as a functional spatial system resulting from the interaction between the distribution of the school age population, educational infrastructure, and administrative structures (UNESCO, 2020; OECD, 2017; Hanushek and Woessmann, 2015; Harris and Jones, 2015; Meyer and Rowan, 2006). Comparative research underscores that school reorganizations are frequently driven by demographic decline, socioeconomic changes, and financial pressures (Howley et al., 2011; Psacharopoulos, 1981).

A central theme in the literature is the impact of per student funding, introduced after 2010, which has placed significant pressure on small rural schools (World Bank, 2018). This situation aligns with international trends, where cost-based funding models have accelerated consolidation processes, particularly in rural or hard to reach areas (Duncombe and Yinger, 2007; Zotić and Alexandru, 2024). Studies show that, although this funding formula is administratively efficient, it has contributed to the accelerated reorganization and merging of schools with small enrolments, especially in mountainous or remote regions (European Commission, 2022).

Recent scientific literature also examines the territorial impact of reorganizations, emphasizing that access to schooling is determined not only by physical distance but also by road infrastructure, the regularity

of transportation, and local socioeconomic conditions (Gray et al., 2018; World Bank, 2021). Similar conclusions are highlighted in international studies, which show that school closures can negatively affect relocated students, particularly in vulnerable or isolated communities (Brummet, 2014; De la Torre and Gwynne, 2009; Engberg et al., 2012). In rural and mountainous areas, the literature points to tensions between the objective of efficiency and the need to ensure the continuity of local schools, which are considered essential elements of community cohesion (OECD, 2021).

Comparative European analyses provide alternative organizational models, such as satellite schools in Spain or intercommunal educational centres in France, where reorganization is accompanied by compensatory mechanisms and differentiated funding. In Finland, small schools are maintained through additional financial support, while in Germany reorganization is very gradual and based on extensive public consultation (Eurydice, 2021; OECD, 2020).

International research on urban and rural school reorganizations suggests that student outcomes depend significantly on the quality of the receiving schools and the logistical support provided to families (Larsen, 2020; Steinberg and MacDonald, 2019; Kirshner et al., 2010; Eddins et al. 2024). American and British studies show that, while the closure of small schools reduces immediate costs, it increases social and educational costs in the long term. Authors emphasize that purely financial pressures lead to the marginalization of rural communities (Egelund, 2006; Lyson, 2002; Oncescu, 2013; Sageman, 2022). Conclusions from the international literature reinforce the perspective that the reorganization of school networks must be both accompanied by compensatory measures and assessed in terms of community impact, not solely economic criteria (OECD, 2020; Eddins et al. 2024, Steinberg and MacDonald, 2019; Woodhall, 1967).

Researchers warn that policies based strictly on cost criteria fail to reflect territorial specificities and may exacerbate educational inequalities (Kim, 2023; Munteanu, 2022). In literature, this process is referred to as “structural efficiency”, but it is considered problematic in sparsely populated areas, where per-student funding has led to pressure related to merging small schools, the dependence of rural units on student numbers, and the intensification of polarization between large centres and peripheral areas (Ionescu, 2014; Rogoz, 2018).

These observations are highly relevant for Romania, particularly in counties with extensive rural dispersion, which face similar challenges. However, institutional responses remain more uniform and less territorially contextualized (World Bank, 2022). Regarding the debate between efficiency and equity,

Romanian authors are divided between two paradigms: the paradigm of economic efficiency (through mergers and cost reduction), a position supported by education economists (Neagu, 2006; Mărginean, 2017), and the paradigm of educational equity (through maintaining local schools), an approach favoured by sociologists, geographers, and NGOs (Apostu et al., 2015).

Overall, the need for a differentiated approach in organizing school network is evident, one adapted to rural, mountainous, and periurban specificities being required. The general consensus is that reorganization policies must be correlated with local impact studies, transport infrastructure, and geographical realities, in order to prevent the widening of disparities in access to education.

Consequently, studies on school mobility and real accessibility at the macro-territorial level indicate a dynamic school network, but with large discrepancies between rural and urban areas, an aspect that justifies our detailed analysis at the micro-regional level (Buza and Tuşa, 2024).

The analysis of both domestic and international specialist literature presented above converges towards several general ideas: school network must be analysed as a complex territorial phenomenon, not merely as an administrative structure; demographic decline is the major factor driving reorganizations, but it is not the only one; the current funding model places disproportionate pressure on rural and mountain area schools; territorial equity is insufficiently integrated into legislation; reorganizations have different effects depending on geography, transport infrastructure, school density, ethnic composition, and local resources; Romania is in a situation similar to other Central and Eastern European states, but the political and administrative response is much more uniform and sometimes lacks local adaptation.

Therefore, it is necessary to employ a differentiated methodology for rural, mountainous, and marginal contact areas, as an essential approach for regions such as Mureş County. Moreover, the absence of predictive models applied to extended statistical series (1992-2023) limits the understanding of long-term trends and the consequences for access to education.

Against this background, the study aims to fill this gap through a demographic and socioeconomic analysis, both quantitatively (number of school units and school population) and qualitatively (equitable access to education in urban and rural areas). It also proposes a multidimensional analysis of the mountainous and marginal space in Mureş County (1992-2023), using statistical models and projections up to 2030, to assess emerging disparities and trends in the geographic distribution of educational opportunities. The purpose is to highlight the structural

and territorial imbalances of the school network in the mountainous and marginal areas of Mureş County, which are relevant when designing more effective public policies in the educational system and social policies to address the various disadvantages faced by young people in Romania and in the study area.

To respond to these premises and achieve the proposed aim, a set of objectives were set, oriented towards quantifying and interpreting educational transformations in the demographic and socioeconomic context. These objectives guide the entire methodological approach and are synthesized in Figure 1.

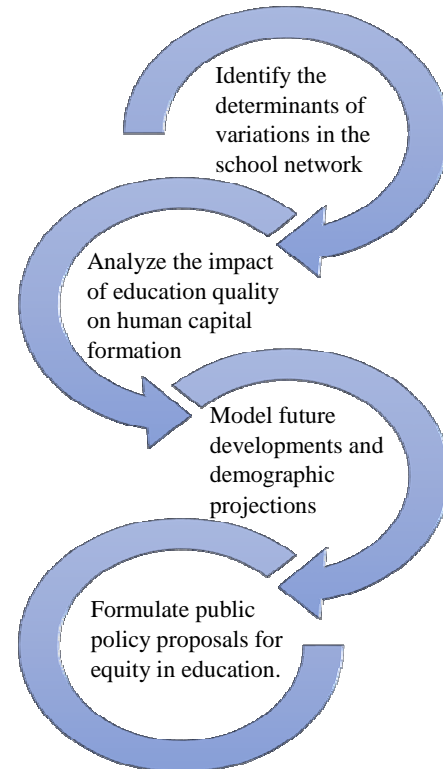


Fig. 1. The specific objectives of the study.

This research aims to answer two main questions: (1) *How has the territorial distribution of educational units and the school population evolved in the mountainous and marginal contact area of Mureş County?* (2) *To what extent have legislative changes and public policies influenced accessibility to education?* The working hypothesis starts from the premise that demographic decline and legislative reorganization processes at the education level have led to the reduction of the school network in rural areas and the increase in educational disparities between rural and urban areas.

2. THEORY AND METHODOLOGY

2.1. Study area

The study area consists of 19 administrative-territorial units (ATUs) from the mountainous and marginal space of Mureş County, including two urban

ATUs (Reghin and Sovata) and 17 rural ATUs, comprising a total of 77 villages (Table 1).

Table 1. List of administrative-territorial units (ATU) with their respective localities in the study area.

No.	ATUs	Allotted settlements
1	Aluniș	Aluniș, Fițcău, Lunca Mureșului
2	Beica de Jos	Beica de Jos, Beica de Sus, Căcuciu, Nadășa, Șerbeni, Sânmihai de Padure
3	Brâncovenești	Brâncovenești, Idicel, Idicel Pădure, Săcalu de Pădure, Vălenii de Mureș
4	Chiheru de Jos	Chiheru de Jos, Chiheru de Sus, Urisiu de Jos, Urisiu de Sus
5	Deda	Deda, Deda-Bistra, Bistra-Mureșului, Filea, Pietriș
6	Eremitu	Eremitu, Câmpu Cetății, Călugăreni, Dămieni, Mătrici
7	Gurghiu	Gurghiu, Adrian, Cașva, Comori, Fundoaia, Glăjărie, Larga, Orșova, Orșova Pădure, Păuloaia
8	Hodac	Hodac, Bicaș, Dubiște de Pădure, Mirigioaia, Toaca, Arșița, Urice
9	Ibănești	Ibănești, Blidireasa, Brădețelu, Dulcea, Ibănești Pădure, Lăpușna, Pârâul Mare, Tireu, Tisieu, Zimți
10	Idecu de Jos	Idecu de Jos, Idecu de Sus, Deleni
11	Lunca Bradului	Lunca Bradului, Neagra, Sălard
12	Răstolița	Răstolița, Andreneasa, Borzia, Gălăoia
13	Reghin	Reghin
14	Rușii-Munți	Rușii-Munți, Maiorești, Morăreni, Sebeș
15	Solovăstru	Solovăstru, Jabenita
16	Sovata	Sovata
17	Stânceni	Stânceni, Ciobotani
18	Suseni	Suseni, Luieriu
19	Vătava	Vătava, Dumbrava, Râpa de Jos



Fig. 2. Territorial delimitation of the study area at regional and national level.

The research area was delimited by combining administrative-territorial and physical-geographical criteria (Fig. 2).

The northern boundary aligns with the administrative border of Mureș County adjacent to Suceava County, while the eastern boundary borders Harghita County and the northwestern boundary coincides with that of Bistrița-Năsăud County. The southwestern and western boundaries follow the contours delineating the administrative-territorial units of Mureș County that are included in the study area.

2.2. Data

The study's information base was built by integrating official national and international sources, along with additional datasets generated and processed during the research. The data used in this study were collected from multiple sources, including official statistical data provided by the National Institute of Statistics (INS), which supplied raw data series for the period 1992-2024 on the number of school units and the school population. Derived datasets were obtained, constructed as data series. Additional administrative data were used, such as population records, information from the Ministry of Education and Research (MEC), the Mureș County Statistical Office (BSJ), and reports on the state of education in Mureș County elaborated by

the County School Inspectorate. The research also incorporated normative acts published between 2011 and 2025, including the Education Law, complementary laws, and ministerial orders and procedures. Furthermore, OECD and Eurostat reports, along with other academic studies addressing the evolution of the school network in Central and Eastern Europe, were consulted.

Since the study aimed to explore the influence of the number of school units in correlation with the school population, we restricted our sample to include only recognized school units with juridical personality.

In order to avoid the methodological risk of interpreting the number of schools in isolation and to ensure analytical robustness, the evolution of the school population was analysed, while also being correlated with the evolution of school units (for example, if the number of pupils decreases by 70%, then a 70% reduction in schools no longer appears excessive). As an efficiency indicator, the number of pupils was reported relative to the number of school units.

The school population represents the total number of children in kindergartens and nurseries, as well as pupils and students enrolled in the process of instruction and education during a school or academic year within formal education, regardless of the type of schooling they attend (day, evening, reduced frequency, or distance learning), the study program, or age. The school age population represents the resident population whose age falls within the official educational age limits for each level of education.

Beginning with the 2012-2013 school year, according to the legislation in force (Education Law no. 1/2011; Law no. 198/2023), the age groups for the school-age population are defined as follows: 0-2 years (pre-preschool), 3-5 years (preschool), 6-10 years (primary), 11-14 years (lower secondary), 15-18 years (upper secondary/vocational), 19-23 years and above (post-secondary/technical/university).

2.3. Methods

The adopted methodology was quantitative-analytical, integrating comparative temporal and spatial elements, structured into the following stages (Fig. 3): data collection and verification – validation of time series for consistency and accuracy, identification of gaps, and correction of errors through cross checks between sources; statistical processing – transformation of raw data into standardized indicators to ensure comparability across years and regions; evolutionary analysis – identification of trends through chronological series analysis and determination of structural changes; indicator correlation – application of correlation and regression techniques to investigate causal relationships between population quality indicators; demographic projections – modelling of

future scenarios using linear extrapolation and the Cohort Component Method of Population Projection (CCMPP).

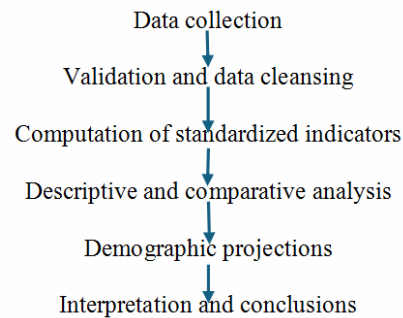


Fig. 3. Methodological workflow of the study.

Each stage of investigation required a complex approach to ensure both the validity and the relevance of the results obtained.

In the present research, we employed integrative modelling, which facilitates the construction of prospective demographic scenarios. This allowed us to anticipate developments and impacts relevant for public policy and strategic planning. Demographic projection models enabled the estimation of population changes based on current trends in natural and migratory dynamics, and the elaboration of multiple scenario analyses, offering a flexible perspective on the future. These scenarios included optimistic, pessimistic, and neutral variations regarding the evolution of the number of students per educational unit.

To quantify the annual rate of decline and rural-urban disparities, the analysis employed statistical modelling of school population data in the study area, disaggregated by place of residence. The dataset, derived from time series provided by the National Institute of Statistics, was analyzed using both linear regression and second-degree polynomial regression, the latter capturing short-term fluctuations in the trend. Models were applied separately for total, urban, and rural categories.

To assess the impact of spatial and educational policies, the study uses a mixed modelling approach, combining linear regression with ARIMA (Autoregressive Integrated Moving Average) models, to capture both the causal relationships between variables and their dynamics over time.

Simple linear regression was used to quantify the relationships between public policies (e.g., investments in spatial/educational infrastructure) and outcomes (e.g., academic outcomes, local economic growth). It allows for the identification of determinants (“what works”) and the isolation of the effect of a particular policy, “what does not work”, adjusting for other control variables. In the case of spatial policies, regression models help understanding how proximity to educational hubs or to infrastructure influences performance.

We used the ARIMA model to analyse time series, which are not chronologically stationary, being able to model trends, seasonality, and autocorrelation in educational or spatial data. It provides short- and medium-term forecasts to estimate the future impact of current policies. Thus, the results can model the trajectory of enrolments or investments in education and assess the impact of specific interventions (e.g. a change in educational policy) by analysing breaks in the series trend.

By using this mixed-method approach, the study ensures accuracy in interpretation, because it separates short-term effects from long-term trends (ARIMA) and identifies the strength of relationships between variables (Regression), as well as a solid argumentation, because it provides an empirical, non-subjective basis for interpreting the results, facilitating the adoption of informed public policies. This methodological mix ensures that spatial and educational policies are evaluated not only in terms of their instantaneous impact, but also of their sustainability over time.

Thus, the study seeks to make a substantial contribution to forecasting the evolution of the number of students per unit in the study area, with applicability at both county and national levels, and with international comparability. As such, we aim to demonstrate the importance of education in designing local policies for the structural development of education and more effective social policies to address the various disadvantages faced by young people, especially in rural areas, with the goal of reducing school dropout, increasing equity, and enhancing investment in curriculum.

3. RESULTS AND DISCUSSION

3.1. The evolution of the school network in Romania in the context of regional educational transformations

To better understand the particularities of the evolution of Romania's school network, it is useful to compare it with other Central and Eastern European states that have undergone similar processes of demographic transition and educational reform after 1990.

Table 2. Average number of students per educational unit in selected countries (2023).

Country	Students/unit	Observations
Romania	429	Overcrowding
Bulgaria	440	Similar overcrowding
Poland	320	Balanced network
Hungary	310	Balanced network
UE average	280	Reference standard

Source of data: Eurostat (2023a) and Eurydice (2023).

The comparative analysis places Romania in proximity to Bulgaria, where the average number of students per unit exceeds 400-450 students/unit (Table 2). By contrast, Poland and Hungary show lower values (200-350 students/unit), because of more balanced reorganization processes and policies aimed at maintaining rural schools (OECD, 2020; Marusynets and Király, 2020; Eurostat, 2023a and Eurydice, 2023).

At the European Union level, the average varies between 200-350 students per school unit, which means that Romania and Bulgaria fall within the zone of school network overcrowding. This difference has implications for the quality of education, access to resources and territorial accessibility. Poland has undergone an intensive process of decentralization and rationalization of the school network beginning with the educational reform of 1999. Although the number of educational institutions was reduced, the government implemented active policies to maintain rural schools. Consequently, the average number of students per school increased moderately, reaching around 250-300 students per unit (OECD, 2020). This value is significantly lower than in Romania, where the phenomenon of massive mergers has led to much greater concentration. In Hungary, school reorganization was driven by demographic decline and youth migration. The number of students per unit was stabilized at 200-350 students, although with notable differences between urban and rural areas (Béres, 2025). Compared to Romania, the process was more balanced, with fewer abrupt fluctuations. On the other hand, Bulgaria presents one of the most similar situations to Romania. After 2000, declining birth rates and massive emigration led to the closure of hundreds of school units, especially in rural areas. The average number of students per school increased rapidly, reaching 400-450 students per unit in recent years (World Bank, 2019). This value is very close to that recorded in Romania, confirming common structural trends in the region.

According to Eurostat and Eurydice (2023a), the average number of students per unit varies between 200 and 350 in the European Union, with significant differences between Nordic countries (where many small units with less than 150 students exist) and southern or eastern European states (where schools are larger, in some cases exceeding 400 students). Romania and Bulgaria are situated at the upper end of this spectrum, indicating a relative overcrowding of schools.

3.2. The evolution of school network in the mountainous and marginal areas of Mureş County (Romania)

Any education system is founded on school infrastructure and human resources, which must be adequately financed and developed. The evolution of

the number of educational units and the school population in the study area, differentiated by residence type (urban, rural), between 1992 and 2023 (Table 3 and Figure 8), highlighted that the number of educational institutions with legal personality in the study area, as well as in the country as a whole, declined sharply during the reference period (1992-2023). A

severe contraction occurred between 2003 and 2006, with the number of units decreasing from 179 at the beginning of the study period (1992), to 172 units in 2000 (a decrease of 3.91%), and then to 46 units in 2010 (a decrease of 74,30%), stabilizing at a much lower level after 2013 (32 units in 2023, with a decrease of 82.12%).

Table 3. Evolution of school units and school population in the mountainous and marginal contact area of Mureş County (1992–2023).

Year	Total no. of units	Rate of decrease %	Rural units	Urban units	Total school population	Rural school population	Urban school population
1992	179	0	130	49	19327	8440	10887
2000	172	3.91	132	40	19193	8425	10768
2010	46	74.30	23	23	17476	7532	9944
2023	32	82.12	17	15	14182	5630	8552

Source of data: National Institute of Statistics (INS) (author's calculations).

This phenomenon is the result of legislative changes regarding school network, which stipulate that: “educational units with less than 200/100 pupils/pre-schoolers shall be organized/reorganized within educational institutions with legal personality, subordinated to the same principal credit authorizer, as their structures” (Art. I, Law no. 354 of July 15, 2004). Furthermore, according to the provisions of Law no. 198/2023 and Order of the Ministry of Education and Research (MEC) no. 5197/2025, it is specified that: “an educational unit with less than 500 pupils shall be merged, and incorporated, as a structure, into other educational institutions with a larger number of pupils or better positioning, while losing its legal personality, in order to ensure the efficient functioning of the educational system”.

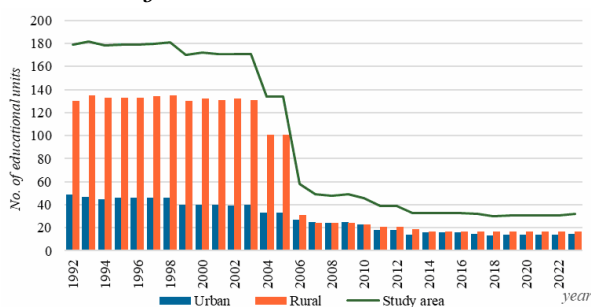


Fig. 4. Evolution of educational units in the study area, by type of residence (urban vs. rural) 1992-2023.

Based on legislative changes in the field of education during this period, the greatest reduction in the number of educational units in the study area was recorded in rural settings, from 130 units in 1992 to 24 units after 2007, stabilizing at 17 educational institutions with legal personality from 2014 to the present. A similar reduction is observed in urban educational units, though with a milder downward trend: from 49 units in 1992 to 25 units in 2007, and to 15-14 units after 2013. This indicates that school

population is larger in urban areas, school infrastructure is better equipped than in rural areas, and, consequently, educational institutions accommodate higher student numbers.

This reduction in the number of educational units (by 82.12%) is only administrative, meaning that schools which did not meet the newly imposed requirements became subordinate structures of other educational institutions within the same administrative territorial unit. In justified cases, where even the subordinate structure no longer met legal conditions for functioning, kindergarten children (enrolled in the final year of education cycle) and compulsory education pupils enrolled in another locality, while being provided with transport, meals, and boarding services, supported by the Ministry of Education and Research, local public authorities, economic agents, local communities, charitable organizations, and other legal or natural persons (Law no. 354/2004; Law no. 198/2023). This phenomenon has led to increased social costs. Hence, four distinct stages can be identified in the evolution of the school network:

Stage of apparent stability (1992-2002): both rural and urban areas maintained a relatively constant number of educational units. This period reflects post-communist inertia, with an inherited educational structure that did not undergo major adjustments despite demographic changes;

Stage of accelerated decline (2002-2007): in the study area, the number of educational units collapsed from 179 to 49. This contraction of the school network corresponds to structural reforms in education (optimization of the school network, reduction of small schools, especially in rural areas). The phenomenon was intensified by external migration and declining birth rates after 1990, leading to depopulation of villages;

Stage of adjustment and consolidation (2007-2013): the number of units continued to decline, though

more slowly, stabilizing around 33 units. In rural areas, schools with legal personality were reduced to a single institution, usually located in the commune centre, while their subordinate structures became increasingly rare. As a result, children’s access to education depended on commuting or school transportation;

Stage of stabilization at a minimum level (2013-2023): the system appears to have been “optimized”, with a rigid distribution of 14-15 urban units and 17 rural units.

The causes underlying this staged evolution of the educational network in the study area, as well as at the country level, are determined by several factors: demographic (highlighted by the steadily declining birth rate after 1990, which drastically reduced student cohorts, and external migration that accelerated the “emptying of villages” of future generations of pupils); socioeconomic (in rural areas of the study region, with declining populations and limited financial resources of local authorities, maintaining schools with small student numbers was no longer justified); and political-institutional (through successive reforms in the education system since the 2000s, promoting centralization and consolidation of educational units by introducing minimum quality standards, classes with reduced enrolments were closed, with certain exceptions pursuing financial efficiency rather than social accessibility).

These causes, with long-term implications, will lead to reduced access to education in rural areas, while greater distances to school will create barriers, thereby increasing the risk of school dropouts and perpetuating social disparities. This situation will accentuate territorial inequality: urban areas remain relatively stable, consolidating their position as educational poles, while rural areas lose infrastructure and opportunities, intensifying spatial polarization. In the long run, the reduction of the number of rural units results in lower levels of education and skills in disadvantaged environments, with negative impacts on human capital and regional development.

Based on the points reviewed above, the analysis highlights the institutional collapse of the rural school network as a cumulative effect of demographic, economic, and political transitions in post-1990 Romania. It serves as a textbook case of how public “optimization” policies can amplify social and territorial inequalities, with long lasting consequences for human capital and social cohesion. Figure 4 illustrates not merely a numerical evolution, but rather the “story” of post-communist social and demographic transition: from an extensive, but inefficient network adapted to a large school population (before 1990), to a restricted, financially streamlined network with major social costs (after 2010). This negative dynamics of rural educational institutions is collectively perceived as a categorical symbol of regression of the settlement, due

to the impossibility of supporting future generations, a phenomenon that is most often irreversible (Haartsen and van Wissen, 2012) and is sometimes perceived as an early indicator of socioeconomic decline or potential depopulation of the settlement (Brouwer, 2019).

In relation to the evolution of the school population in Romania over the last ten years, which, according to the Report on the State of Education for 2023-2024 recorded a decline of 10% (Ministry of Education and Research, 2024), the progress observed in the study area (based on INS data) for the reference period (1992–2023) shows a decrease of 26.62%, which is far below the reduction in the number of educational units (82.12%). This discrepancy does not justify such a sharp reduction in the number of schools.

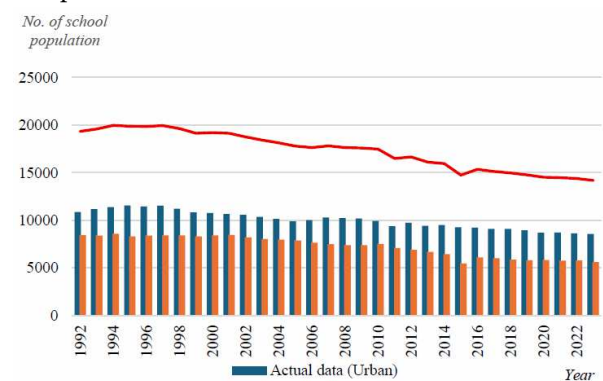


Fig. 5. The evolution of the school population during the period 1992–2023.

Figure 5 provides a longitudinal picture of demographic and educational transformations in the study area, within the context of major socioeconomic processes such as the transition to a market economy, internal and external migration, declining birth rates, and changes in educational policies.

The general trend indicates a constant and significant decline in the total number of pupils, from 19,327 in 1992 to 14,182 in 2023. This reduction of 26.62% reflects a process of school depopulation with multiple causes, namely demographic decline, determined by the sharp fall of birth rate after 1990 because of the socioeconomic uncertainties and changing family models (Mureşan, 2007); increased international migration, Romania recording one of the highest emigration rates in the EU after 2000, fact that caused reduced school enrolments especially in rural areas (Sandu, 2010; Dezi et al., 2014), and urbanization and educational mobility, which stimulated migration toward urban centres, which act as demographic and economic poles, thereby generating additional declines in rural areas.

Under these conditions, a rural-urban differentiation emerges. In urban areas, the initial level of school population was lower in 1992 (10,887), followed by a slight increase until 1997 (11,533), after which a slow but relatively constant decline set-in,

reaching 8,552 pupils in 2023. On this trajectory of urban school population, a slight stabilization can be observed after 2010, suggesting that urban areas have been able to mitigate the effects of population decline and demographic fluctuations due to their stronger economic opportunities and institutional capacity, from 8,440 pupils in 1992 to approximately 5,630 in 2023. In rural areas, however, the evolution of the school population shows a constant decline. The sharper pace of decline in rural populations indicates a double marginalization: on the one hand, the depopulation of villages, and, on the other hand, the reduced access to quality educational infrastructure. This is compounded by the reduction in the number of schools and the increase in distances, both restricting school accessibility.

This asymmetry between rural and urban reflects the socioeconomic polarization of the population in the study area, as well as in Romania, and it is consistent with the literature on rural education as a space of structural vulnerability (Voicu and Marian, 2010; Stanef, 2013).

The structural vulnerability of rural education is evidenced by educational inequalities, in the sense that the rural–urban gap exacerbates the issue of unequal opportunities in access to education. Recent studies confirm that the rate of early school dropout is significantly higher in European rural areas (Eurostat, 2022a; Eurostat, 2023b; Gbaguidi and Adetou, 2024), where reactive educational policies, characterized by fragmented institutional responses such as school closures, mergers, and ad hoc support programs have frequently been implemented in place of coherent and effective structural reforms. These measures have contributed to a downward spiral in rural areas, where the reduction in pupil numbers led to diminished resources, which in turn accentuated school migration toward urban areas (Lehtonen, 2021; Petre et al., 2025; Sageman, 2022).

This dynamics generates what can be described as reflexive modernity, a process that can also be interpreted in terms of Beck’s theory (1992), where late modernity causes social risks that manifest in education through depopulation, mobility, and institutional uncertainty.

If the trend continues, the study area will face a sharp contraction of the school population, which will affect the sustainability of the network of educational institutions, the quality of education in disadvantaged areas, social inclusion, and intergenerational mobility.

Recently, certain solutions have been implemented - both financial and developmental - at central and local levels, and especially supported by European funds (European Commission, 2024; European Union, n.d.). However, we consider that these measures, which are meant to revitalize the educational system, should be oriented towards differentiated

policies by type of residence, massive investments in digitalization, the real and competent training of human resources, increasing school satisfaction among both pupils and teachers, and shifting the paradigm from “quantity” to “quality”, with emphasis on curriculum, school transport, and the integration of a social justice approach in education (Sen, 1999).

Linear regression shows the general trend of a constant decline in the number of pupils, confirming the hypothesis of a structural demographic decline, with an average linear decrease of -207 pupils per year (-96 pupils/year in urban areas and -111 pupils/year in rural areas). The linear model explains 95.6% of the variation ($R^2 = 0.956$) (Fig. 6a).

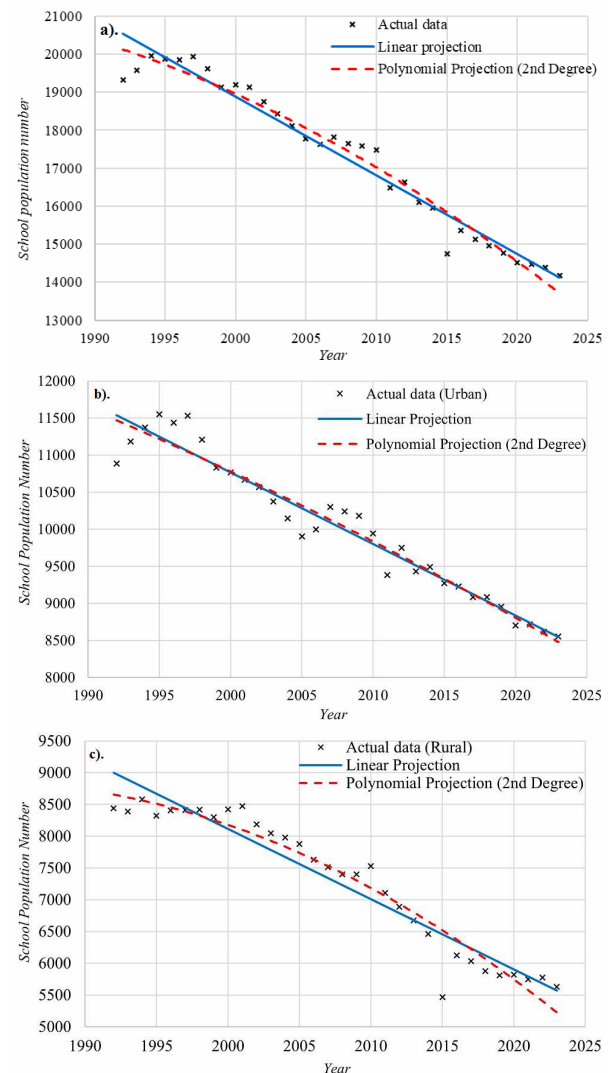


Fig. 6. Trend in linear and polynomial regression of the school population in the study area (a - total) and by type of residence (b - urban; c - rural), 1992-2023.

Polynomial regression highlights distinct phases of decline, with a slower decrease in the 1990s, followed by an intensification after 2005, especially in rural areas (correlated with massive migration and declining birth rates after 1990), which is not fully captured by the linear regression. The polynomial model slightly improves precision ($R^2=0.967$),

capturing inflection points around the years 2000 and 2010. Rural-urban differences (Fig. 6b, c) are clear: urban areas lose fewer pupils per year (-96 compared to -111), but since the rural school population is smaller, the relative impact is much more severe in rural areas ($R^2=0.914$ linear and $R^2=0.939$ polynomial). The urban trend is more stable, with a relatively constant decline, confirmed by the closeness of the two models ($R^2=0.942$ linear and $R^2=0.943$ polynomial).

Based on the two models (linear vs. polynomial), a projection of the evolution of the number of pupils in the study area was carried out up to the year 2035. Figure 7 shows the linear and polynomial trends of the two models.

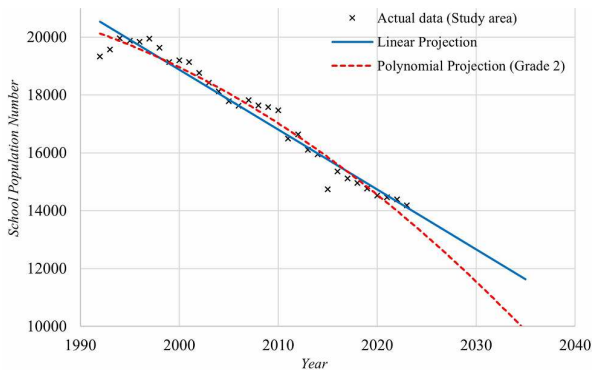


Fig. 7. Projected evolution of the school population in the study area until 2035.

The linear model captures the overall trend of decline, but may overestimate the number of pupils in the long term. The polynomial model better reflects the acceleration of decline driven by the evolution of the rural school population, suggesting a sharper decrease after 2023. From the perspective of educational policies, rural areas are in the most critical situation, risking a reduction to fewer than 3,500 pupils by 2035.

Thus, by analysing the evolution of the school population compared to the number of educational units between 1992 and 2023 (Fig. 8), it was found that, although the school population decreased by 26.6%, the number of educational institutions declined by 82.12%.

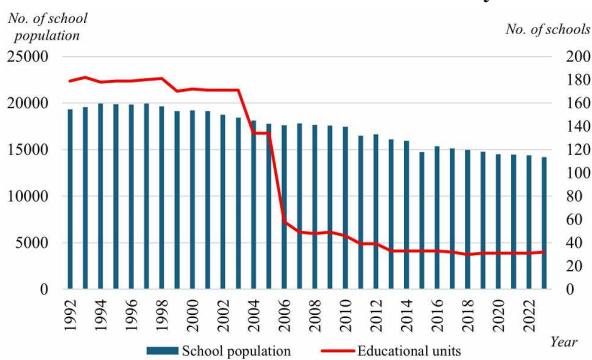


Fig. 8. The evolution of the school population and the number of educational institutions between 1992-2023.

This disproportion has major implications, leading to overcrowding in some urban schools, while

simultaneously eliminating access to education in isolated rural communities. This will increase educational inequalities by widening the gap between urban and rural areas and limiting access to education for children from vulnerable groups (particularly Roma children or those from socioeconomically disadvantaged families).

This evolution highlights the tension between the efficiency of the school network and the need for educational inclusion. In the context of European objectives to reduce early school dropout to below 9% by 2030 (European Commission, 2022), the findings highlight the necessity of public policies that balance the efficiency of the school network with accessibility to education (Muntele et al., 2021).

Recent strategies, namely National Recovery and Resilience Plan (NRRP - Component 15 – Education and the National Strategy for Reducing Early School Dropout 2021-2027, propose the reestablishment of educational units in disadvantaged areas, the development of digital infrastructure to compensate for the lack of access, integrated support programs for children at risk of dropout, and diversification of vocational training (Government of Romania, 2021b; Ministry of Education and Research in Romania, 2015). However, the results depend on aligning these measures with demographic and socioeconomic realities.

The dual process of contraction, consisting in the demographic decline of school population, driven by demographic and social factors, and the reduction of the school network as a result of political and administrative decisions to merge small schools, especially in rural areas (Tomuleţiu and Moraru, 2010) has placed additional pressure on access to education, particularly for children from disadvantaged environments. It has also placed Romania among the EU states with the highest levels of early school dropout (Eurostat, 2023b).

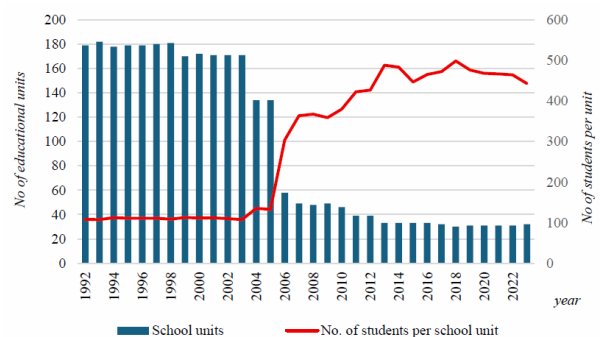


Fig. 9. The evolution of the number of pupils per educational unit in the study area, 1992-2023.

To confirm the previous analysis, a correlation was made between the number of pupils and the number of educational units (Fig. 9), which reveals the evolution of the two statistical series over the same time span (1992-2023).

Statistical analysis of the available data for the period 1992-2023 shows a profound structural transformation of the school network in the study area. In the 1990s, there were between 170-182 school units, with a relatively constant average of about 110 pupils per unit. After 2005, however, an accelerated process of rationalization and consolidation of educational units took place. Thus, their number decreased to approximately 30-40 units starting in 2010, which led to a sharp increase in the average number of pupils per unit, from 135 pupils/unit in 2004 to around 500 pupils/unit in 2017-2018. After this peak, the indicator entered a slight downward trend, reaching 443 pupils/unit in 2023. This evolution in the number of pupils per educational unit was caused by several factors, as follows:

- the process of reorganization and consolidation of the school network, through the closure or merger of small units and the formation of larger educational institutions (consolidation), in the context of demographic developments and educational policy aimed at structural efficiency. The goal was to optimize resources, provide a more comprehensive educational offer in regional centres, and reduce operating costs. OECD reports and European documents analyse such reforms and recommendations for Romania (European Commission, 2023);

- the process of urbanization and redistribution of pupils through internal migration toward schools in towns (Reghin and Sovata), which led to a decline in pupil numbers in rural schools and overcrowding in urban institutions. These urban schools became regional educational centres, allowing for an increase in the number of pupils per school where population density remained higher. UNESCO and OECD studies discuss the geographic and regional impact of school dropout and exclusion (UNESCO, 2024; OECD, 2024);

- other causes with major implications for the education system, such as changes in funding, minimum criteria for the functioning of an institution, improved accessibility (school transport enabling consolidation in centres), and local policies encouraging regionalized education (OECD, 2017; OECD, 2018; OECD, 2024; Eurydice, 2025).

These causes, which led to the reorganization of the school network and the increase in the number of pupils per unit, have both positive and negative effects. Among the positive effects of these reorganizations and mergers in the school network of the study area, which resulted in an increase in the number of pupils per educational unit, the most significant is the improvement in the quality of education, meaning that the consolidation/reorganization of the school network can lead to a more varied curricular offer (including a wider range of elective subjects and extracurricular activities that enhance students' learning experience),

qualified human resources, well-equipped classrooms and laboratories, and high schools and vocational schools with multiple programs. However, the negative effects resulting from this process in the educational system, and beyond, consist of increased travel time due to longer commuting for pupils from rural areas; loss of the community - school connection for small villages and deeply rural areas; a higher risk of absenteeism and school dropout; the disappearance of local schools, which accentuates rural-urban territorial inequalities; and the need to realign budgetary resources, human resources, and school infrastructure to a more concentrated network. These access and outcome issues for vulnerable groups in the education system of the study area, problems that are in fact characteristic for the entire Romanian education system are also highlighted by the OECD (2024).

In the long term, the school network in the study area remains concentrated in urban settings, but the main risk is the underutilization of existing rural units as a result of declining pupil numbers per school. If authorities maintain the current structure, some schools will become undersized, while, if a rural repopulation policy emerges, reopening or reorganization may be required.

To observe the trend in the evolution of the number of pupils per educational unit, statistical series provided by INS were used, applying the ARIMA (Auto Regressive Integrated Moving Average) time series model, which generated a forecast for the average number of pupils per educational unit up to 2030 (Fig. 10).

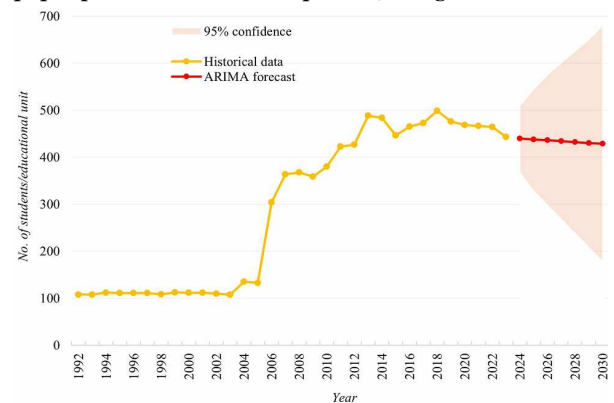


Fig. 10. The evolution of the number of pupils/educational unit in the study area during the period 1992-2023 and the trend up to 2030.

After the expansion period of 2005-2018 (~500 pupils/unit in 2018) in the study area, the ARIMA model estimates a slight decline until 2030 (from 440 to 429 pupils/unit), in line with the decrease in the school population. The confidence interval shows greater uncertainty in the long term, with possible minimum values even below 300, if demographic decline accelerates.

Based on the ARIMA forecasting model, the data suggest that, in the absence of major changes, by 2030 the average number of pupils per unit will

stabilize between 429-440 pupils/unit, marking a relative stagnation after the expansion period of 2005-2018. For comprehensive understanding, three prospective scenarios were developed (Fig. 11):

- the pessimistic scenario (accentuated demographic decline, intensified migration, declining birth rates): the indicator could fall to around 345 pupils/unit in 2030. This variant reflects negative demographic trends observed in other studies (Rotariu, 2011; Gheţău, 2004);

- the normal scenario (business as usual, BAU) (continuation of current trends without significant interventions): the average number of pupils/unit would remain relatively constant, around 430-440 pupils/unit, confirming a phase of unstable equilibrium in the school network;

- the optimistic scenario (proactive educational policies, support for birth rates, and reduction of migration): this could generate a slight increase to 470-480 pupils/unit in 2030.

This scenario assumes structural measures such as investments in school infrastructure, incentives for teachers, and support programs for young families (Tomuleţiu and Moraru, 2010; Gheţău, 2007).

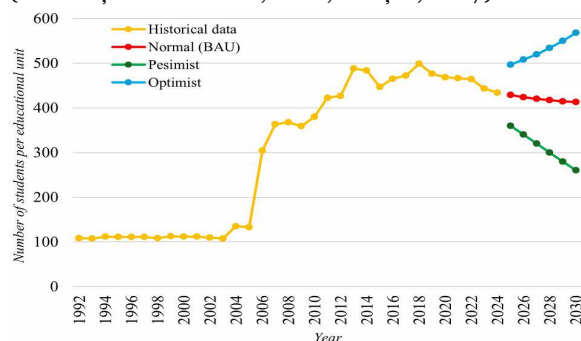


Fig. 11. Trend in the evolution of the number of pupils/ educational unit under the three forecast scenarios, 2023-2030.

By comparing these scenarios we can note a significant gap between pessimistic and optimistic projections (over 130 pupils/unit in 2030), underscoring the vulnerability of the educational system to demographic trends and the importance of well-targeted public policies.

Based on historical data, forecasts, and international comparisons, the following directions for public policy can be formulated for implementation in Romania's educational system and in the study area:

- sustainable management of the school network by balancing economic efficiency with equitable access to education;
- reduction of territorial disparities by supporting small rural schools, modern school transport, and digitalization;
- adaptation of human resources through policies to attract teachers to rural areas and continuous training programs;

- integration of education into demographic strategies by correlating with measures to support young families;

- development of a National Strategy for the School Network 2030, including demographic forecasts, quality standards, and predictable funding mechanisms.

The reduction of the number of school units, combined with the decline in the school population, accentuates territorial inequalities and the risk of dropout in rural areas. Overcrowding in urban schools may affect the quality of education. Compared to other Central and Eastern European countries, Romania is placed in a risk zone of overcrowding, which requires proactive policies for equity and sustainability (OECD, 2020; Marusynets and Király, 2020; World Bank, 2019).

4. CONCLUSIONS

The analysis of the transformations of the school network in the mountainous and marginal areas of Mureş County highlights a restructuring process dominated by the logic of economic efficiency, materialized by reducing the number of educational units and increasing the concentration of students in the remaining schools in rural areas and especially in urban areas. Data shows that this administrative efficiency occurs along with a growing pressure on educational accessibility and on territorial equity, especially in poorly connected and demographically vulnerable communities. The tendency of population to agglomerate in increasingly larger school units is not only a statistical phenomenon, but signals a profound reconfiguration of the relationship between school and territory. In mountainous and marginal areas from Mureş County, schools do not only have an educational role, but also a social function within the community. The contraction of the local school network in these predominantly rural areas, with a high degree of isolation, indirectly contributes to enhancing the risks of marginalization, negatively boosting the migration of young families, accentuating the phenomenon of population ageing and experiencing an irreversible demographic decline, which can further generate a vicious circle of local underdevelopment. Compared to other countries in the region, results indicate that the high level of the average number of students per school unit is not only the result of demographic decline, but also of an insufficiently calibrated territorial reorganization model. Unlike Poland or Hungary, where rationalization processes were accompanied by substantial investments in school transport, infrastructure and support services, in restructured Romania it was often applied uniformly, without sufficient differentiation between accessible urban areas and rural territories in hilly or mountainous areas with major geographical constraints.

The forecasts for the period 2024 - 2030, even under moderate assumptions, indicate the continued concentration of students within a limited number of educational institutions and suggest a heightened risk of exacerbating structural and spatial disparities in the context of adverse demographic trends. This indicates that, in the absence of deliberate interventions, the current dynamics will not spontaneously lead to a convergence towards European standards regarding the size of school units and equitable access to education. In this context, the current research supports the need for a paradigm shift in educational policy, from a predominantly accounting-based approach to the school network toward an integrated and systemic one, which would regard schools as a strategic infrastructure for territorial cohesion.

Based on the empirical findings, the following concrete directions of intervention were formulated.

a). Introduction of a territorially differentiated model of school network organization. Reorganization policies should include geographical and accessibility criteria (travel time, relief conditions, seasonality), not only demographic and financial indicators. In mountainous and isolated areas, maintaining small school units can be justified as a measure of territorial equity, not as inefficiency.

b). Development of an integrated education system for those communities where consolidation is inevitable. This should be accompanied by: stable investments in safe and locally adapted school transport, "school after school" programs and free school meal programs, as well as counselling services and psycho-pedagogical support for commuter students. Thus, reducing the number of schools does not automatically translate into reducing real access to education.

c). Correlation of educational policies with local development policies. Data shows that institutional school withdrawal amplifies the decline of fragile communities. Therefore, decisions regarding school network should be correlated with rural development strategies, infrastructure, health services and youth policies, so that it is regarded as a key element of local resilience.

d). Decrease of school overcrowding by investing in school infrastructure and human resources. The high average number of students per unit triggers risks to the quality of the educational activities. The following measures are necessary: expanding and modernizing the infrastructure in oversized schools, policies to attract and maintain teaching staff in rural and mountainous areas, reducing the student-teacher ratio in units with a high workload.

e). Introduction of territorial impact assessments when making decisions regarding school reorganization. Any proposal for closure or merger should be preceded by an impact analysis that includes:

travel distance of students to school, risk of dropout, socioeconomic vulnerability of the community, and the role of the school in local life.

f). Strengthening the educational database and spatial analysis tools. The limitations encountered in the current research indicate the need for a more coherent and geo-referenced statistical system, which would allow for real-time monitoring of educational accessibility to support evidence-based decision-making.

Overall, the study shows that restructuring of the school network is not a socially and territorially neutral process. The manner in which this transformation is implemented may either exacerbate existing polarizations or contribute to their alleviation, thereby promoting greater equity across the system. Education, especially in marginal mountain and hilly areas, must be treated not only as a public service, but as a strategic investment in social cohesion, territorial balance and long-term development.

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