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Romania’s South-Muntenia Region, towards Sustainable Regional Development. Implications for Regional Development Strategies

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Abstract: Currently, at the end of the programming period 2014–2020 and in the view of the new programming exercise, 2021–2027, knowing where South-Muntenia is positioned on the path to sustainable regional development and how the main determinants can be integrated in regional development policies in order to continuously support the development of the Romanian regions becomes even more important. In this context, the paper aims to evaluate the progress made by the South-Muntenia region towards sustainable regional development for the period 2010–2017 highlighting the main implications for regional development strategies and revealing local initiatives promoting broader sustainable regional development. Thus, more in depth, the paper aims to identify the main determinants of sustainable regional development at the level of South-Muntenia counties using multiple principal component analysis (MPCA), to build an advancement sustainable development index based on panel data for the period 2010–2017 and to reveal the main sustainable development poles at the county level for the year 2017 using hierarchical clustering technique. The empirical results revealed the importance of business environment, public services infrastructure, education, and social protection as main determinants of South-Muntenia sustainable regional development. The advancement composite index pointed out that South-Muntenia recorded a slow but continuous advancement in terms of sustainable regional development, almost doubling its performance in these seven years. At the county level, if Prahova, Argeș, and Dâmbovița exhibited a so-called stagnation, Ialomița and Teleorman were still behind, registering an advancement over the period but remained only halfway on the path to sustainable development, while Calarasi and Giurgiu tried to recover the huge gap, registering very low rates of sustainable development index. On the path to regional economic development, the relevance of two main sustainable regional development drivers can be highlighted—a better allocation for active measures with the reduction of unemployment as a target together with a better infrastructure of public services. National, regional, and local administrations play an important role in promoting sustainability in the economic, social, and environmental activities, in a coherent manner. Regardless of the level at which development policies are designed, local, county, or regional, they must take into account and monitor the sustainable development determinants if the ultimate goal is the overall regional development of South-Muntenia.
Keywords: sustainable regional development; regional development strategies; Romania; South-Muntenia region; multiple principal component analysis; cluster analysis; panel data analysis; advancement sustainable development index

1. Introduction

Economic and social issues represent a priority in public debate over the world, the concept of sustainability being a political and scientific tool that can integrate other aspects of the country.

Over time, European regional policy has played an important role in rebuilding regional economies, leading to the strengthening of EU economies. During this time, in order to achieve the objectives, the policy can be redesigned and improved.

Until now, Romania developed the National Sustainable Development Strategy for 2008, 2020, and 2030, covering all 17 Sustainable Development Goals (SDGs) of the Sustainable Development Agenda. In light of regional and country disparities of EU member states, in order to promote growth and sustainable employment opportunities at the regional level, each region should have established a profile of sustainable development, reflecting the objectives of the EU Strategy of Sustainable Development. At national level, the key objectives can only be achieved by having a detailed knowledge regarding the situation at the level of each administrative region.

For a state to achieve sustainable development, effective tools are needed in order to facilitate the sustainability management process and allow the implementation of numerous strategies and programs. These programs must be implemented in a pyramid system, from the highest level to the lowest administrative structures.

In Romania, development regions express the framework for elaborating, implementing, monitoring, and evaluating regional development policies, including here the regional development strategies and economic and social cohesion programs. At the regional level, Regional Development Strategy 2014–2020 of South-Muntenia and Regional Development Plan 2014–2020 of South-Muntenia are in force in Romania as main regional strategic policies together with Smart Specialization Strategy for South-Muntenia and County Councils Development Plans 2014–2020 for each county of the region. For the next period, 2021–2017, a new dedicated strategic programme for South-Muntenia Regional Operational Program will support mainly programs covering areas: Smart specialization and innovation, SMEs, digitalization, energy efficiency, city, mobilization and connection, biodiversity, culture, and infrastructure/cultural heritage. Taking into account national, regional, and local needs, granted projects will ensure the strategic program for sustainable use and balancing of South-Muntenia region.

In the context of completion of the programming period for most of the strategic regional programs and in view of the new period of programming, 2021–2027, knowing where South-Muntenia is positioned on the path to sustainable regional development and how the main determinants of sustainable regional development can be integrated in regional development policies in order to continuously support the development of Romanian regions becomes even more important.

Therefore, the paper aims to evaluate the progress made by the South-Muntenia region towards regional sustainable development for the period 2010–2017, highlighting the main implications for regional development strategies and revealing local initiatives promoting broader sustainable regional development.

Where is the South-Muntenia region on the path of sustainable regional development and what are the main implications for regional development? These are the main questions of our research. In attempting to answer this question, the empirical analysis will be structured on three levels.

On the first level, we will identify the main determinants of sustainable regional development at the level of South-Muntenia region counties using multiple principal component analysis (MPCA) and build an advancement sustainable development index based on panel data for the period 2010–2017. In such a way, we will be able to highlight the advancement recorded by region counties during the
period 2010–2017 and also to evaluate the distance still to be travelled to achieve the desideratum of sustainable development. In order to analyze the advancement on the path of sustainable regional development, the research relies on the counties of South-Muntenia region: Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova, and Teleorman, analyzed over the horizon 2010–2017, putting together all three dimensions of sustainable development: social, economic, and environmental. Also, at this level, the main sustainable development poles at the county level for the year 2017 will be highlighted using the clustering technique.

On the second level, we will examine how sustainable development could impact the regional economic development based on panel data analysis and forecasting simulation scenarios. On the third level, we will highlight how sustainable development determinants can be integrated in regional development strategies, analyzing how they can subscribe to the strategy objectives. The paper will end summarizing and briefly presenting the local initiatives meant to promote broader sustainable regional development.

The paper is organized in the following sections. Section 1 represents the introduction, highlighting the relevance of topic and the main aim of our research. Section 2 presents main theoretical considerations regarding sustainable development, regional development, and sustainable regional development at EU level, as well as national and regional, highlighting the most relevant studies in the field of sustainable regional development analyzed from the perspective of the main dimensions, social, economic, and environment, in the particular case of South-Muntenia region.

Section 3 is dedicated to the presentation of data and methodology, briefly presenting the main techniques that will be used in the analysis.

Section 4 is dedicated to empirical results and is divided into four sub-sections. The first one reveals the main determinants of sustainable development at the county level for South-Muntenia region and presents the entire empirical process of building the advancement sustainable development index, a synthetic measure able to quantify the progress made by South-Muntenia region towards the desideratum of sustainable development, while the second sub-section offers some insights about the main leading and lagging sustainable development poles.

Within the third sub-section, the focus will be on how the determinants of sustainable regional development can be integrated into regional development strategies, highlighting their relevance in measuring the progress made by the South-Muntenia region on the path of sustainable development.

The last section captures the impact of sustainable development determinants on the overall level of economic development for South-Muntenia counties, also offering some insights about future evolution of this economic development based on forecast simulation scenarios using panel data analysis. The paper ends with main conclusions and policy implications, briefly presenting local initiatives encouraging sustainable regional development.

2. Sustainable Development, Regional Development, and Sustainable Regional Development—Theoretical Considerations

Sustainability represents the link between social sciences and civic engineering and environmental science and future technology. Sustainability aims to protect our natural environment, human, and ecological health, while leading innovation and not compromising our way of life. Sustainability issues are ubiquitous in global and national development agendas [1].

Sustainable development has multiple definitions, but the most well-known is the definition given by the United Nations World Commission on Environment and Development, according to which represents the “development that meets the needs of the present, without compromising the ability of future generations to meet their own needs” [2]. In the Brundtland report in 1987, sustainable development was defined as meeting the needs of the present, without compromising the ability of future generations to meet their needs [3].

Regional development represents an integral community development in a certain territory, presenting seven dimensions: social, economic, environmental, medical, technological, cultural,
and recreative. Regional development considers territorial and socioeconomic classical policies in the specific political and cultural context, aiming at social, natural, and economic development [4,5].

Sustainable development presents three dimensions: economic, environmental, and social, representing a solution to many international, regional, and local problems facing society today: overcrowding, disease, political conflict, infrastructure damage, pollution, unlimited urban expansion, and availability of limited resources.

Currently, regional development is characterized by multiple crises, including financial, food, and energy, being necessary to re-evaluate the economic paradigm and to assess the principles of employment, social progress, quality of life and respect for nature. The integration of the three pillars of sustainable development at regional level implies economic growth, but without endangering the planet’s scarce resources [6].

Regional sustainability represents “the continuous support of human quality of life within a region’s ecological carrying capacity” [7,8], involving economic development with the assumption of the availability of certain natural resources, but without exceeding the region’s environmental capacity [9,10].

Sustainable regional development is focused on human dignity, regional and global stability, a healthy planet, resilient societies, and prosperous economies. The main areas governed by regional policies are enterprise development, labor market, attracting investment, technology transfer, SME development, infrastructure improvement, environment, rural development, health, education, and culture.

Sustainable regional development was defined by Clement, Hansen, and Bradley as “integration of sustainable development principles into regional development practice” [11].

Nijkamp et al. [12] defined regional sustainable development in terms of space and well-being. From a spatial perspective, it reflects the potential and constraints of natural resources and the environment in order to support development in regions. From a welfare perspective, regional sustainable development involves development, ensuring that the regional population can achieve an acceptable level of well-being both now and in the future.

Giaoutzi and Nijkamp defines sustainable regional development according to the three general areas (economic, social, and ecological) in a given geographical area [13]. The economic aspects are reflected by income, production, investments, market evolution, and price formation. The social aspects are reflected by income distribution, access to markets, wealth, and positions of power of certain groups or regions and environmental issues are reflected by quality of life, resource scarcity, pollution, and related variables.

Using sustainable competitiveness as an umbrella that combines sustainable development and competitiveness, Avram et al. [14] analyzed the impact of ICT skill mismatch on SME’s sustainable competitiveness in the presence of a guaranteed minimum wage, and its impact on employment. Based on a panel VAR model for EU 27 covering the period 2007–2015, the authors pointed out the validation of a major hypothesis: ICT personnel and skills have a positive effect on employment and growth. They also examined the impact of guaranteed minimum wage on employment and SME’s sustainable competitiveness pointing out correctly that the effects of an increase in the minimum wage could lead to inflation, bankruptcies, and unemployment and ultimately to informality [15]. The empirical results revealed that the last increases in the minimum wage were conducive to a positive effect on job creation and employment, stipulating that the Romanian labor market creates low added value jobs [14].

From the perspective of sustainable regional development, the implementation of regional development policies needs to take into account all levels, starting with the European one and continuing to the local level (Figure 1).
2.1. Sustainable Regional Development at EU level

In order to reduce both country and regions disparities, regional development policies have been implemented, being supported by the European Strategy 2020 and European strategy for sustainable development. In the process of building a smart, sustainable, and inclusive economy, five major goals have been stipulated by the Strategy Europe 2020:

1. Employment (employment rate of 75% among the population aged 20–64).
2. Research-development-innovation (public and private investment in research—development of 3% of the GDP of the European Union).
3. Climate change and energy: (a) a 20% reduction in greenhouse gas emissions from 1990 levels; (b) increasing the share of renewable energy sources up to 20%; and (c) 20% increase in energy efficiency;
4. Education: (a) reducing the dropout rate below 10%; (b) increasing to over 40% the share of higher education graduates among the population aged 30–34;
5. Poverty and social exclusion (reducing the number of people who suffer or are at risk of suffering from poverty and social exclusion by 20 million) [16].

At the European level, in 1992, the Maastricht Treaty regulated that national subunits be endowed with constitutional powers and models of regionalization: cultural regionalization, reflecting a distinct regional identity; economic regionalization, aiming at the efficiency of the public administration in relation to the citizens; and fiscal regionalization through which regional authorities set local taxes and expenditures, so that regions support only the costs of the services they benefit from [17].

Sustainable regional development is a concept that involves challenges for the regions of the European Union since the Treaty of Amsterdam in 1997 [18].

Regional development policy represents a set of measures planned and promoted by local and central government in order to establish dynamic and sustainable economic growth, capitalizing on regions and local potential, thus improving living conditions [17].

At the level of the European Union, sustainable regional development involves the integration of the principles of sustainable development in the practice of regional development, including activities and tools that promote sustainable development on regional economic initiatives [6].

Regional sustainable development is influenced by resources related to natural and cultural characteristics, innovation capacities and specialization models, the regions endowed with natural resources reflected a poor socio-economic performance, and developed tourism [19]. The impact on sustainable regional development focused on the themes: socio-economic development, consumption and production, social inclusion, demographic change, public health, climate change, and energy [20] and natural resources, and used taxonomic methods in the form of the well-being development model.
as methods [21]; the main barriers to the implementation of sustainable development standards are the lack of awareness and understanding of the concept of development [22].

In order to achieve sustainable regional development, investments in private companies to create new jobs and decrease unemployment rate, investments in education in order to reduce school dropout, and investments in health system or infrastructure so as to be accessible to entire population are necessary [23]. It is also necessary to consider the deconcentration of people, therefore new job concentrations need to meet various criteria for the sustainability of others, such as promoting the use of public transport, applying land use forms, or reducing transport distances to suppliers and customers [24]. Various ICT core indicators at the European Union level significantly impacts two of the sustainable development goals: economic growth and reduction of inequality [25]. In addition to all this, the central factor for sustainable regional development is represented by environment, unfavorable environmental trends resulting from unsustainable use of energy and natural resources [26]. At the EU level, three factors are identified that significantly influenced the environment: employment in foreign-controlled enterprises, the eco-innovation index [27], and the region [28]. The state of the environment and the practical application of the principles of sustainable economic development in ecological conditions was analyzed by Chiriţescu et al., [29], Gibbs and Jonas [30], Roberts [31], and Der Zwan et al. [32], highlighting the importance of the regional planning in implementing the objectives of sustainability, depending on characteristics such as gender and urban or rural areas.

Territorial distribution of the water is another important potential indicator concerning sustainable regional development; the water footprint of national consumption in the 28 EU Member States register a very low degree of concentration, therefore it tends towards uniformity [33] and the water footprint of agricultural products depends on the specificity of the country, and grouping of countries and types of consumption of agricultural products are unequal distributed [34].

2.2. Sustainable Development at National Level

Within EU sustainable regional development are included in the European Strategy, but they need to be regulated at the national level, taking into account the national specificity and the country degree of development. In this sense, in Romania sustainable development is regulated by the National Strategy for Regional Development 2014–2020, Regional Operational Program 2014–2020, National Strategy for Sustainable Development 2030, National Development Plan 2014–2020, and National Reform Program 2019.

The National Strategy for Regional Development [35] represents the vision of the Romanian Government on regional development, which institutes the development priorities of the regions and institutional relations to facilitate the correlation with sectoral strategies, aiming at regional development. The Regional Operational Program [36] aims to increase economic competitiveness and improve the living conditions of local and regional communities by encouraging the development of business environment, infrastructure, and services, ensuring the sustainable development of regions, able to efficiently manage resources and capitalize on their potential for innovation and assimilation of technological progress. These funds, as now provided by the institutional architecture of the 2014–2020 programming period, are largely controlled at the central level, through the ROP Management Authority 2014–2020, from the Ministry of Public Works, Development, and Administration (MLPDA). For the future European funds, from the programming period 2021–2027, the Regional Operational Program will be divided into eight smaller regional programs, one for each development region of the country, according to the proposal of the Ministry of European Funds. The Ministry of Public Works, Development, and Administration will no longer have the managing authority for the ROP, from 2021. Instead, there would be eight managing authorities at the level of each development region. Basically, the current Regional Development Agencies (RDAs), which currently have only an intermediate body, with only a few responsibilities delegated by the Ministry of Public Works, would become managing authorities themselves.
Through the National Strategy for Sustainable Development [37], Romania establishes its national framework for supporting the Agenda 2030 and the implementation of the set of 17 SDGs. The strategy supports the development of Romania on three main pillars, namely economic, social, and environmental. The National Development Plan represents the document of strategic planning and multiannual financial programming, which aims to guide and stimulate the economic and social development of the country to accomplish the goal of achieving economic and social cohesion. The NDP carries out programming similar to that carried out by the Member States of the European Union regarding the established objectives. The role of the National Reform Program is to implement the Europe Strategy at national level.

According to Law no. 315/28 from June 2004 [38], Romania’s regional development policy is characterized by a set of governmental policies developed by central government bodies, local government authorities, and specialized regional bodies, in order to ensure economic growth and social and sustainable development of the regions and to reduce economic and social inequalities between Romania and other EU countries [17].

The legal framework on sustainable regional development must harmonize the National Regional Development Program with the principles of sustainable development. The directions of action involve: reshaping the rules on public management; improving the institutionalized partnership system; regulating access to information of public interest; ensuring an unique and coherent interpretation of the laws; improving market mechanisms; ensuring the protection and conservation of the environment and natural resources; achieving a balanced development of the territory-urbanization, infrastructures, transport, and pollution; and an Environmental Code of Ethics to improve economic behavior in the direction of environmental protection.

The directions in which Romania must act are:

- Stopping the processes of deterioration of the natural capital and the genetic structure of the population;
- Achieving a real, functional market economy, which should ensure the free movement of goods, capital, services and people, and the competitive market;
- Promoting a complex and coherent system of laws, in line with the acquis communautaire;
- Developing a flexible and efficient system in the educational field;
- Establishing a system of indicators to diagnose the level of regional development according to the principles of sustainable development;
- Reducing the level of exploitation of non-renewable resources by promoting non-polluting technologies, with reduced consumption of raw materials, materials, and energy;
- Developing a system for monitoring the dynamics of the economic and social system in correlation with the evolution of the quality of life [39].

For territorial development policy harmonized with the policies of the European Union and financial support for development of the territorial profile, Romania has created eight development regions.

The main objectives of regional development in Romania are:

- Decreasing the regional inequalities by stimulating balanced development through reducing the delays regarding development due to historical, geographical, economic, social, and political conditions;
- Associating policies and sectorial government activities at the regions level by stimulating initiatives and capitalizing local and regional resources, in order to ensure their real development;
- Stimulation of interregional and international cooperation, as well as their economic and institutional development [40].

In Romania, the economic policy priorities are represented by “balanced and sustainable territorial development of regions in Romania”, and “reducing economic and social inequalities between Romanian regions and between Romania and other EU member states” [41].

Figure 2 provides the conceptual framework of theoretical considerations between the three main dimensions of sustainable development and their intersections and Table 1 offers an overview of the
most relevant studies regarding sustainable development achievements for Romania as well as for South-Muntenia region.

The patterns of sustainable development and the elements that impacted the process during the last years highlighted that regions and cities are the keys for national growth [42]. Romania is registering regional disparities regarding economic, social, and territorial cohesion [43,44], foreign direct investments [45,46], development [47], GDP [48], productivity and employment [49], share of research and development [50,51], economic, ecological, and social development [52,53]. Considering the probability of performing a sustainable development, the Romanian counties are heterogeneous, being grouped in 4 classes [54], some counties having the necessary characteristics in order to be taken in consideration when choosing the core county of each new region [55].

![Figure 2. On overview of the most relevant studies from the literature regarding the main pillars of sustainable regional development.](image)

Others significant differences between regions are identified on infrastructure development, social demography, and intellectual capital, the highest concentration being in the Bucharest-Ilfov region, as a result of developed infrastructure and the migration of young and a very well-prepared labor force [56]. The regional disparities are the result of economic status and structure of the regions, the regions where urban activities are predominant, the geographical proximity to Western markets, and the possibility to attract investment in the secondary and tertiary sector [57].

Regional policy in Romania and the impact of urban growth poles are very important on sustainable development socially, economically, and environmentally [47]. Regional sustainable is influenced by
research and development, being highlighted a correlation between the evolution of GDP per capita in regions and the expenditures made on research and development [50]. Regarding research, the most developed regions in Romania were Bucharest, West, North West, and Central Region, recording the best performances regarding the patents per million employees [51].

Regarding the potential of protected natural areas, tourism represents an important factor for sustainable development, if it is realized responsibly and respects the conservation and regeneration of environmental resources [58]. The factors influencing tourism and transport in terms of sustainable development are nominal GDP, GDP per capita, and number of employees. GDP significantly influences the density of national roads, and number of employees influences the tourism activity [59]. Fundeanu applied a regional cluster, presenting the significant importance of a tourism cluster as the link between the economic, social, and environmental sectors, highlighting the benefits of the clusters for sustainable development of the region, the cooperation between the population, local entities, and investors of the region, and the contribution of the defined clusters to a higher standard of living and a growth in the local economy [60].

2.3. Sustainable Regional Development in South Muntenia Region

Given that there are differences between states and regions regarding relief, social, and economic development, adopting programs and strategies is necessary in order to reduce regional disparities. At the level of South-Muntenia region, the Strategy for Smart Specialization of the South Muntenia Region, South Muntenia County Development Plan, Regional Development Strategy of South-Muntenia Region, Regional Development Plan 2014–2020 of South-Muntenia Region, and first version of Regional Operational Program of the South-Muntenia Region are implemented.

Regional Development Plan 2014–2020 objective [61] is represented by stimulating a process of sustainable and balanced economic growth based on innovation and favorable to social inclusion that would lead to increase of prosperity and quality of life.

The Strategy for Smart Specialization of the South-Muntenia Region for the period 2014–2020 [62] aims to support those sectors in which the regional economy is competitive on global markets, changing and modernizing the existing production models. Thus, the region will be supported by selecting a limited number of priorities, depending on its strengths, its competitive advantages, and the potential for a lasting impact.

South Muntenia county development plan [63] implements the objectives of the Region Development Strategy at the county level.

Regional Development strategy of the South-Muntenia Region [64] is based on the development plan, the aim being to increase the region’s capacity for sustainable and balanced economic and social development, leading to reducing disparities and increasing economic and social cohesion, prosperity, and standard of life for the inhabitants of the region.

The first version of the Regional Operational Program of the South-Muntenia Region implemented the Regional Operational Program objectives at the regional level.

The development region represents an association of counties in order to facilitate their development in an integrated and balanced manner. The Development Region represents an area that includes the territories of several counties established on the basis of conventions concluded between the representatives of the county councils, but also the framework for elaboration, implementation, and evaluation of regional development policies, including collection of specific statistical data. Development regions are not territorial administrative units and do not have legal personality; legally in Romania, regional development is regulated by Law 315/2004.

The South-Muntenia Development Region is a non-administrative structure that surrounds the Bucharest-Ilfov area, being the third region from Romania as dimension. It includes 7 counties, 16 municipalities, 32 cities, and 519 communes composed of 2019 villages. The South-Muntenia Region covers an area of 34,453 km², of which Argeș County has 6826.3 km², being the 10th county in the
country. The seven counties that compose the region are Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova, and Teleorman.

The South-Muntenia region is divided into two sub-areas with different geographical and socio-economic characteristics. The northern part of the region, including the counties: Arges, Dâmbovita, and Prahova, is characterized by a high degree of industrialization, with Prahova being the first county in the country in terms of industrial production. The main problems facing this area are related to the decline of industrial units, which has generated a high unemployment rate. The closure of some industrial units in the mono-industrial areas determined the appearance of some serious economic and social problems, especially in the mono-industrial urban areas: Mizil, Moreni, Plopeni, Urlăți, Costesti, and Câmpulung-Muscel. The southern part of the region including the counties Calarasi, Giurgiu, Ialomița, and Teleorman, is an underdeveloped traditional area, representing the second pole of poverty in Romania after the North-East region.

The location of the South-Muntenia region presents commercial opportunities due to the existence of the Danube River at the southern border, as well as the connection it gives to the Black Sea and Bulgaria, the connection being made through three crossing points.

Henry Coandă Airport from Bucharest is close to the South-Muntenia region and has supported the easy access of investments in the southern part of Romania along with the highway segments present in the region. The diversified relief of the region and the significant hydrographic network led to the existence of as diverse natural resources.

The region concentrates multiple reserves of oil, ores, salts, natural gas, mineral springs, and coal (in hilly and mountainous areas), significant resources for activity in industries.

The agricultural sector operates on an area of over 71.1% of the total region, of which 80.6% represents arable land.

The geographical advantages of the region are the natural and cultural capital in agriculture, industry, ecotourism, and renewable energy.

The participation in the labor market is made mainly by males, representing 55.03% of the total active population of the region. At the same time, an active presence in the labor market can be observed, the region registering approximately 13% of the total active population of Romania in 2017.

The top counties regarding economic activity are Arges and Dâmbovita counties in agriculture, forestry, and fishing activities; Arges and Prahova counties in industry, manufacturing, and construction; and Arges, Dâmbovița, and Prahova in activities related to wholesale and retail trade and vehicle repair.

The phenomenon of unemployment in the South-Muntenia region is observed especially among young people, the region being affected by depopulation in rural areas and migration of young people to urban areas, and those from urban areas to Bucharest or Western Europe, either for studies or permanently for a job.

The advantages of this region are: (a) high coverage with telecommunications networks; (b) existence within the region of Bucharest-Henri Coanda International Airport; (c) the existence of some segments of the European transport corridors IV and IX, as well as the existence of the A1 (Bucharest-Pitesti) and A2 motorway segments (Bucharest-Drajna), (d) modernized national and European road networks, (e) cheap and skilled labor, and (f) existence of land suitable for organic farming.

South-Muntenia region represents a less developed region in Romania, achieving a GDP below 75% compared to the European Union average, the rural predominance not representing a high degree of attractiveness for investors. The spatial indicators of sustainable development registered an oscillating evolution in time, with Arges and Prahova being counties with significant positive evolutions [65], one important objective being sustainable agriculture [66]. The rural population represented 58% of the region’s population, declining due to low birth rates, high mortality, and migration. Most people are working in agriculture, therefore the standard of living, reflected in GDP, registered low values, and the average income and household expenditure were much lower than the national average [67]. The rural development strategy must contain measures and indicators of development at an integrated level regarding the region infrastructure development strategy, the strategy for the development of SMEs,
and the strategy for environmental protection. Strategies and programs for increasing the nutritional level (qualitative and quantitative) of the rural population [65] are solutions for performance evaluation from a sustainable agricultural point of view.

This region registers different problems regarding development, but highlights many efforts in order to achieve a sustainable region [68], with the subsidies having an important impact on South-Muntenia region development [69].

The studies on sustainable development [70,71] in the South-Muntenia region analyzed indicators from different domains: Gross Domestic Product; Gross Domestic Product per capita; employment rate; unemployment rate [72,73]; the number of employed persons in research and development activity; monthly gross average wage [65]; rural population, rural population engaged in agriculture; human resources [67]; employed civilian population; average income; monthly household expenditure; and poverty rate [74,75]; highlighting their importance for the regional sustainable development.

In conclusion, regional sustainable development needs to be included in the regional development strategies if the purpose is the overall regional development.

Based on the previous theoretical considerations, the following hypotheses have been formulated in order to stipulate how sustainable regional development can support the overall economic development of South-Muntenia region:

**Hypothesis 1 (H1).** Public services infrastructure is a relevant determinant of the sustainable regional development at the level of South-Muntenia region;

**Hypothesis 2 (H2).** Social protection is a relevant determinant of the sustainable regional development at the level of South-Muntenia region;

**Hypothesis 3 (H3).** Education is a relevant determinant of the sustainable regional development at the level of South-Muntenia region;

**Hypothesis 4 (H4).** Business environment is a relevant determinant of the sustainable regional development at the level of South-Muntenia region;

**Hypothesis 5 (H5).** Overall, South-Muntenia region registered an advancement in terms of sustainable regional development;

**Hypothesis 6 (H6).** Public services infrastructure, as a driver of sustainable regional development, contributes to the economic development of South-Muntenia region;

**Hypothesis 7 (H7).** Social protection, as a driver of sustainable regional development, contributes to the economic development of South-Muntenia region;

**Hypothesis 8 (H8).** Education, as a driver of sustainable regional development, contributes to the economic development of South-Muntenia region;

**Hypothesis 9 (H9).** Business environment, as a driver of sustainable regional development, contributes to the economic development of South-Muntenia region.

3. Data and Methodology

The central objective of this paper is to evaluate the progress made by the South-Muntenia region towards regional sustainable development for the period of 2010–2017, highlighting the main implications for regional development strategies and revealing local initiatives, promoting broader sustainable regional development.
More in depth, the research aims to:

- Identify the main determinants of sustainable regional development at the level of South-Muntenia region counties and build an advancement sustainable development index using MPCA based on panel data for the period 2010–2017;
- Highlight main sustainable development poles at the county level for the year 2017 using the clustering technique;
- Highlight how sustainable development drivers can be integrated in regional development strategies;
- Examine if the main determinants of sustainable regional development could be the leading factors towards economic development;
- Reveal local initiatives promoting broader sustainable regional development.

In line with the main objective of our paper, the empirical analysis aims to response to the following specific research questions: What are the main determinants of sustainable regional development? Does the South-Muntenia region registered an advancement in terms of sustainable regional development during the period 2010–2017? What are the main leading counties in terms of sustainable regional development at the level of 2017? Do the drivers of sustainable regional development contribute to regional development policies? Does the sustainable regional development support the economic development of the region? Do the local initiatives promote broader sustainable regional development at the level of South-Muntenia?

In order to respond to all these questions, the research relies on the counties of South-Muntenia region: Arges, Călărași, Dâmbovita, Giurgiu, Ialomița, Prahova, and Teleorman, analyzed over the horizon 2010–2017, putting together all three dimensions of sustainable development: social, economic, and environmental (Figure 3).

Therefore, the social dimension of sustainable regional development covered indicators from 5 areas, summarizing a number of 21 indicators, while the economic dimension of sustainable regional development covered indicators from 3 areas, summarizing a number of 13 indicators. The last dimension, the environmental one, has taken into account 3 indicators. The analysis variables have been selected taking into account their use in the cited literature, analytical soundness, measurability, country coverage, relevance to the phenomenon being measured, and relationship to each other.

A detailed description of the variables used in the analysis is presented in the Supplementary Material (Table S1). The main source of data used for all these indicators is the Tempo database, the eDemos—Statistical information system in territorial profile of National Institute of Statistics, as well as the Regions database of Eurostat.

Limitations of the Study

Due to massive lack of data for 2018, we have taken into account 2017 as the last year of our analysis. Also, due to lack of data simultaneously for specific counties and periods, the following potential variables could not be included in the analysis: variables related to innovation, energy (resources and consumption), investment, turnover of active enterprises, governance indicators, volume of European funds, foreign direct investment, informal employment, NEETS, expenditure on health, and the quality of policies.

In the first level of our analysis, in order to evaluate the progress made by the counties of the South-Muntenia region towards sustainable development, an advancement sustainable development index has been build using MPCA based on panel data for the period 2010–2017. The main utility of such a composite index consists in the convenience to compare in the same time over space and time, revealing the performances of counties region.

The utility of such an aggregate measure resides in the opportunity to make comparison simultaneously over space and time, illustrating the sustainable regional development performance across region counties over time.
Table 1. An overview of the most relevant studies on sustainable development at national, regional, and local level.

| Dimension | Authors | Study |
|-----------|---------|-------|
| Economic  | Davideescu and Strat (2014) [55] | An analysis of the Romanian counties that have the necessary characteristics in order to be taken in consideration when choosing the core county of each new region. |
|           | Bălăcescu and Gogonea, Zaharia, and Babucea (2016) [53] | Analysis of the factors that influence economic development in the 8 development regions in Romania. The results indicated that regional divergence has been amplified, the limited impact of balanced territorial development policies, maintaining or increasing inequalities. |
|           | Manole and Tache (2015) [59] | Analysis of the factors influencing the indicators that characterize tourism and transport using linear regression models with spatial effects. The results indicated that the nominal GDP significantly influenced the density of national roads, the GDP per capita and the number of employees being relevant factors that influence the tourist activity. |
|           | Zaman, Vasile, Panait, Croitoru and Enescu (2011) [45] | Considering foreign direct investments, the discrepancies are highly visible on the Romanian regions, large investments being concentrated in the Bucharest-Illfov region. |
|           | Constantinescu, Florescu, Nicolae, Grigore and Turcu (2017) [68] | The analysis of the economic perspective of sustainable development in the South-Muntenia region revealed problems on their varied development and highlighted a series of efforts to achieve a sustainable region. |
|           | Sandu (2015) [47] | Emphasizing the importance of regional policy in Romania and the impact of urban growth poles on sustainable development at all three social, economic, and environmental levels. |
|           | Gradinaru, Fan, Ioja, Nita, Suditu and Hersperger (2017) [42] | Analysis of sustainable development models and the elements that have influenced the process in recent years, regions and cities that have led to national growth. |
|           | Adriana and Alexandru (2014) [54] | Analysis of counties that can fuel the future sustainable regional development of Romania, identifying the importance of the poles that can coagulate, at regional level the available resources. |
| Social    | Talmaciu (2012) [51] | Analysis of regions in Romania in terms of research. The most developed regions in Romania were Bucharest, West, North West, and Central Region, recording the best performances regarding patents per million employees; the least developed region, the North-East region ranked sixth in terms of indicators analyzed. |
|           | Dachin and Postoiu (2015) [50] | Analysis of the impact of research and development at regional level and of regional sustainable growth. The study was conducted in the counties of Romania and concluded that there is a direct link between the evolution of GDP per capita in a region and spending on research and development. |
|           | Lincaru and Ciucă (2011) [72] | Unemployment rate analysis in the South Muntenia region using Anselin method. |
|           | Bucur and Bucur (2015) [75] | Analysis of the demographic dimension of sustainable development in the South Muntenia region. The results made a diagnosis of the region from a demographic perspective, as a starting point to build alternatives for sustainable local development. |
|           | Gheorghe and Sima (2014) [73] | Analysis of the development of the labor market in the South Muntenia region, studied through the perspective of sustainable development. The results indicated that in the Southern counties agriculture and services are predominant, while the North counties predominates industry, with unemployment being slightly higher compared to the national level. |
| Dimension                  | Authors                              | Study                                                                                                                                                                                                 |
|----------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment                | Marian, Gogonea, and Andrei (2015)  | Analysis of the tourism potential of protected natural areas in Romania, in the context of sustainable development. The results indicated the tourism potential of natural areas is an important factor for sustainable development, if it is done responsibly and respects the conservation and regeneration of environmental resources. |
| Social and environment     | Miron, Dima and Vasileache (2009)   | Analysis of the regional disparities in Romania regarding infrastructure development, social demography, and intellectual capital. The results indicated a concentration of intellectual capital in the Bucharest-Ilfov region, being the result of a developed infrastructure and the migration of young and very well-prepared labor force. The North-West and South-Muntenia regions registered an above average value regarding the infrastructure index, the population rejuvenation index being high and negative for the North West and positive, but small for South Muntenia, where the intellectual capital index is slightly negative for both regions. |
| Social and economic        | Sandru and Dumitru (2015)            | Analysis of sustainable development in terms of investments to create new jobs and reduce the unemployment rate, investments in education to reduce school dropouts, and investments in the health system or in the infrastructure to be available to all categories of the population. |
|                            | Boldea, Parean and Oti (2012)       | Analysis of the regional development level in Romania using the indicators: GDP, productivity, and employment. Regarding this, these indicators have been identified regional disparities between development regions in Romania. |
|                            | Soare, Soare and David (2014)       | Analysis of sustainable development in the South-Muntenia region, analyzing the following indicators: Gross domestic product; gross domestic product per capita; employment rate; the number of employed persons in research and development activity; monthly gross average wage. The results indicated that the South-Muntenia region represents a least developed region in Romania. |
|                            | Petre (2018)                         | Analysis of the evolution of the rural population and its standard of living in the South Muntenia region during 2007–2016, using the following indicators: rural population, rural population engaged in agriculture, human resources, civilian employed population, GDP and GDP/capita, income average and monthly household expenditure and poverty rate. The results indicated that the rural population represents 58% of the region’s population, declining due to low birth rates, high mortality, and migration. |
| Economic and environment   | Lascar and Draghici (2012)           | Analysis of the potential of the South-Muntenia Region in order to identify the level of sustainable development and to increase this level. For the South-Muntenia Region the rural development strategy must contain measures and indicators of development at integrated level regarding the area infrastructure development strategy, the strategy for the development of SMEs, the strategy for environmental protection; strategy and programs for increasing the nutritional level (qualitative and quantitative) of the rural population. |
| Dimension          | Authors                        | Study                                                                                                                                                                                                 |
|-------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Economic, social  | Beciu, Nistor, Popa and Olteanu (2011) [43] | Analysis of the eight regions of Romania on economic, social, and territorial cohesion, the results identifying significant differences.                                                                        |
| and environment   | Fundeanu (2016) [60]            | A regional cluster analysis presenting the significant importance of a tourist group as a link between the economic, social, and environmental sectors. Cooperation between the population, local entities and investors in the region and defined groups contributes to a higher standard of living and to a growth of the local economy. |
|                   | Burja (2011) [52]               | Analysis of the level of sustainable development of the regions in Romania, highlighting a heterogeneity from this point of view. Qualitative differences were identified between regions in terms of economic, ecological, and social development. Bucharest-Ilfov and South-Muntenia have positive sustainable values and the South-East and North-East Regions have the lowest efficiency of sustainable development. |
|                   | Pirvu, Hagiu and Ungureanu (2018) [57] | Analysis of the level of sustainable development in the regions of Romania, identifying that the North East and South regions of the country are less developed, and the West and North West regions are more developed. The explanation is the economic level and the structure of the regions, the regions where rural activity is predominant, the geographical proximity to Western markets, and the possibility to attract investment in the secondary and tertiary sector. |
|                   | Andreica and Popa (2011) [70]   | Analysis and forecast of indicators that reflect sustainable development in case of the South-Muntenia Region.                                                                                                                                                     |
|                   | Partal and Popa (2012) [71]     | Analysis of the South-Muntenia Region in terms of sustainable development, proposing a regional development model that refers to the development directives and how to be successful in this field.                                                                      |
|                   | Lascar (2014) [69]              | Analysis of the impact of subsidies on the development of the South-Muntenia Region, highlighting the imbalances regarding the development between the South and North regions in terms of social indicators.                                                             |
Figure 3. Indicators of sustainable regional development.
Thus, if the interest resides in knowing which counties are making progress on the path of sustainable development and which counties are making less progress, the solution is to develop a composite index [53].

According to the Handbook on Constructing Composite Indicators, the main steps that need to be followed in the process of development of a composite indicator are: “theoretical framework, data selection, imputation of missing data, multivariate analysis, normalization, weighting and aggregation, visualization of the results” [76]. Nardo et al. [77] highlighted the importance of normalization of the data if there are different measurement units. In order to avoid the problem of different measurement units, the first step is to standardize the indicators, using in the analysis the z-scores of the variables.

The method utilized to identify the main determinants of sustainable regional development at the level of South-Muntenia counties refers to multiway PCA (MPCA) representing a generalization of PCA, involving the reduction of a large number of indicators into a few principal components that represent linear combinations of the original variables, uncorrelated, which will recover much of the variance of original variables. The selection of the optimal number of components is based on the Kaiser Criteria, selecting only the eigenvalues greater than 1. In order to aggregate the principal components into a single composite index, it will be use the proportion of variance recovered by each component in total variance recovered by all principal components.

A detailed description of the methodology of constructing composite indices is presented in the studies of Nardo et al. [77], OECD [76], Davidescu et al. [27], Abdi and Williams [78], Mourão [79], and Nomikos and MacGregor [80].

In order to investigate the correlation degree within the dataset, the Cronbach Alpha (c-alpha) coefficient was determined, which is the most common estimate of the internal consistency of the items in a model. Thus, when the correlation is high, then it can be said that indicators can be used to build a composite indicator. Nunnally suggests 0.7 as an acceptable reliability threshold. However, some authors use 0.75 or 0.80 as a limit value, while others consider it 0.6 [81].

Once sustainable regional development drivers have been identified at the South-Muntenia county level, the aggregation within a composite index as a synthetic measure is obtained taking into account the weights from PCA, considering the proportion of variance recovered by each component in the total variance recovered by all the selected components for the non-standardized index.

Due to the fact that the index can have positive or negative values, making difficult any interpretation, it will be transformed to take values between 0 and 100 using the percentile rank, stating that 100 is the best performing and 0 is the worst. The method shows the advantage of highlighting the effort of convergence between cases, from the worst (observation for a county in a given year) to the best, rewarding the best performing entities and sanctioning the weakest [27].

In order to assess the quality of the results obtained by PCA, the Kaiser-Meyer-Olkin Test (KMO) and Bartlett’s Test of Sphericity tests were applied. KMO measures the adequacy of the sample and must exceed the threshold of 0.5 for a satisfactory analysis to be performed. Bartlett’s sphericity test is used to test the null hypothesis that individual indicators in a matrix of correlation are not correlated, so the correlation matrix is an identity matrix.

It is important to note that one of the elements of originality of this research resides in the opportunity of analyzing the South-Muntenia region simultaneously over time and space, incorporating all counties for the period 2010–2017.

Trends in country performance, as revealed through a composite indicator, can be presented through trend diagram. Having a synthetic measure available at the level of region counties for at least two different time points, changes or growth rates can be depicted [26]. The Advancement Sustainable Development Index is used to track relative performance of South-Muntenia counties on sustainable development indicators.

Cluster analysis is another tool used in the development of composite indicators that creates a hierarchy of classes (clusters), frequently used after a PCA for grouping information on counties based on their similarity on the main principal components. The objective is to find a partition in classes that
maximizes the inertia between-classes or minimizes the inertia within classes. This clustering criterion based on inertia allows for creating classes homogeneous in their composition and heterogeneous between them [76].

Therefore, using the main principal components previously identified, hierarchical clustering based on Ward method and Squared Euclidian distance was applied to reveal the most relevant sustainable development poles in the South-Muntenia region and to highlight, once again, the advancement in accomplishing the desideratum of sustainable development during the period 2010–2017. The MPCA and cluster analyses have been realized with SPSS 20 version software.

On the second level of our research, we examined whether the main determinants of sustainable regional development previously identified through MPCA could be the leading factors towards South-Muntenia economic development using panel-based regression analysis for the period 2010–2017. GDP per capita was used as main measure for county economic development, while the main determinants of sustainable development were included as predictors. Due to sample data limitations, seven alternative specifications of the panel regression analysis were considered, as follows:

\[
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}1_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}2_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}3_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}4_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}5_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}6_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it} \\
\text{GDP}_{\text{per capita}}_{it} = \beta_0 + \beta_1 \text{PC}7_{it} + \beta_2 \text{county}_1 \text{capital} \text{pop}_{it} + \beta_3 \text{urban}_{it} + \epsilon_{it}
\]

where \(i = 1, \ldots, 7\) represent the counties of the South-Muntenia region, \(t = 1, 2, \ldots, T\) represents the time (period 2010–2017), \(\beta i\) are the parameters of the model. The real GDP per capita of the county is determined by reference to the harmonized index of HCPI prices based on 2015 = 100, expressed in millions lei; \(\text{FP}1, \ldots, \text{FP}7\) represents the seven main components—synthetic measures obtained from the previous section, expressed in values from 0 to 100; \(\text{county}_1 \text{capital} \text{pop}_{it}\) represents the population of the county capital expressed in thousands of people; \(\text{urban}\) represents the degree of urbanization of the county determined as a share of the urban population in the total population.

The presented analysis in this paper was performed on a data series for the period 2010–2017. The data sources used are Tempo databases, available on the website of the Romanian National Institute of Statistics and the Eurostat databases. The data that references the county GDP, the number of inhabitants in the county, and the number of inhabitants in the county capital city were downloaded from the Tempo database. Also, using information from the same source, the degree of urbanization was calculated by the authors, for each county, throughout the entire analysis period. The regression analysis was performed with the statistical software Eviews 9.

When applying the panel models, it was important to decide the type of model with fixed effects or random effects. For this, the Hausman test was applied.

The application of the Hausman test, in the first phase, involves estimating a model with random effects. A high value of the chi-square statistic (\(\chi^2\)) of the Hausman test, corresponding to a \(p\)-value probability (prob.) lower than the significance threshold of 0.05, leads to significant differences between the coefficients, which requires the rejection of random effects as inconsistent and use the panel estimate based on fixed effects models FEM (fixed effects models) as more appropriate. In the case of a relatively low value of the respective test (accompanied by a high \(p\)-value probability), it determines the approach of the REM type effects (random effects models).

In the analysis based on panel data, homoscedasticity is a basic hypothesis, which must be verified. The White test is used to test the homoscedasticity hypothesis. If the phenomenon does not face
homoscedasticity and heteroscedasticity occurs, the most common remedy applied is the technique (standard errors corrected in the presence of heteroscedasticity) heteroscedasticity corrected standard errors—used in estimating models, which is based on improving standard deviations of estimators, without modifying estimates of coefficients.

Another basic hypothesis of the model to be verified states that there is no linear relationship between two or more explanatory variables (absence of collinearity) [82]. Testing the autocorrelation of errors in the model estimation involves the application of Durbin–Watson (DW) statistics, which may suggest first-order autocorrelation of residues. The existence of a collinearity can be corrected using the generalized least squares (GLS) method.

Establishing the validity of the model envisages the application of the Fisher test. The interpretation of the results takes into account the critical probability related to the Fisher test (prob.). If the probability of F-test is smaller than the assumed significance level, then the established model is considered valid.

Based on the panel data regression analysis, the main sustainable development determinants with significant impact on the county economic development have been identified and, furthermore, using all this information, a forecast scenario of future evolution of county economic development has been built.

Therefore, the objective was to evaluate what was the level of real GDP per capita, in the event of a future increase in the performance of sustainable development indicators using the results of panel data regression analysis, with the forecast being considered for the next 3 years: 2018–2020.

The forecast scenario takes into account the advancement of sustainable development determinants depending on the absolute changes from one year to another as well as the absolute average change over the whole period, keeping the degree of urbanization and the population of the county capital at the same values as for the last year of the analysis (2017) for the forecast horizon.

To achieve this, stochastic dynamic simulation scenario was used, taking into account forecasts from previous periods, rather than actual historical data when assigning values for the predictors (dynamic simulation), as well as that the same sort of errors may occur in the future as seen in historical data. Furthermore, some of the coefficients were estimated, rather than fixed at known values, therefore a level of uncertainty has been associated (stochastic simulation).

Lastly, on the third level, we highlighted how sustainable development determinants can be integrated in regional development strategies, analyzing how they can subscribe to the strategy objectives.

4. Empirical Results

4.1. Building an Advancement Sustainable Development Index for the Counties of South-Muntenia Region

In order to identify the main determinants of sustainable regional development at the level of South-Muntenia region counties and build an advancement sustainable development index, MPCA based on panel data for the period 2010–2017 was used together with cluster analysis for the year 2010 and 2017.

Having a complete dataset, with different measurement units, z-scores were used in order to normalize the data.

In order to evaluate how well a set of elements measures a single one-dimensional object, the Cronbach’s Alpha coefficient was used (Table 2), its empirical value of 0.8137 highlighting a good internal consistency of indicators, the value being above the limit of 0.7 specified in other studies [81].

| Cronbach’s Alpha | N of Items |
|------------------|------------|
| 0.8137           | 37         |

The empirical results revealed the existence of seven principal components, who recovered nearly 89.1% of the variability in the original variables. Kaiser’s criterion was used to extract the main
components, selecting the supraunitary components that together explain almost 89% of the variability of the 37 variables.

Taking into account only the existence of a unique principal component (accepting only the first synthetic indicator), it can be observed that this one recovers almost 39.16% of total variance, while the second principal components recovers another 15.58% of total variance, summarizing a total of 54.75% of total variance. The third component provides an additional contribution of 12.1% of total variance, while the last four principal components revealed smaller and smaller contributions, summing up a total of 89.09% of total variance.

In order to explain the significance of the principal components is calculated the correlation coefficients between the three main components and the original indicators need to be analyzed. To facilitate interpretation, it is recommendable to apply a rotation technique in order to obtain components on orthogonal axes, with the “Varimax” method being the most common rotation technique used for this purpose.

Loading results from an orthogonal rotation represent correlation coefficients of each variable with the factor, ranging from −1 to +1. A negative loading indicates the results need to be interpreted in the opposite direction from the way it is worded.

The second step involves finding which initial variables are most correlated with each principal component. Afterwards, each of the principal components needs to be renamed so that it can be regarded as a new dimension, a new class that needs to include the significance of all the initial variables. Therefore, each component can be “explained” by the initial variables for which the correlation coefficients have the highest values (the results are presented in Table 3) [76]. Table A2 (Appendix A) revealed the Rotated Factor Loadings for sustainable development, a powerful suggestion of the weights that will calibrate each variable in the aggregate index. These results were achieved through the Principal Components Extraction Method with Varimax normalized variation.

| Component | Initial Eigenvalues | Extraction Sums of Squared Loadings | Rotation Sums of Squared Loadings |
|-----------|---------------------|------------------------------------|----------------------------------|
|           | Total               | % of Variance                      | Cumul. %                         | Total               | % of Variance                      | Cumul. %                         | Total               | % of Variance                      | Cumul. %                         |
| 1         | 14.492              | 39.167                             | 39.167                           | 14.492              | 39.167                             | 39.167                           | 8.346               | 22.558                             | 22.558                           |
| 2         | 5.765               | 15.582                             | 54.748                           | 5.765               | 15.582                             | 54.748                           | 6.254               | 16.904                             | 39.461                           |
| 3         | 4.469               | 12.078                             | 66.827                           | 4.469               | 12.078                             | 66.827                           | 4.731               | 12.786                             | 52.247                           |
| 4         | 2.933               | 7.926                              | 74.756                           | 2.933               | 7.926                              | 74.756                           | 4.424               | 11.957                             | 64.204                           |
| 5         | 2.592               | 7.006                              | 81.758                           | 2.592               | 7.006                              | 81.758                           | 4.290               | 11.594                             | 75.798                           |
| 6         | 1.605               | 4.338                              | 86.096                           | 1.605               | 4.338                              | 86.096                           | 3.412               | 9.223                              | 85.021                           |
| 7         | 1.110               | 3.000                              | 89.096                           | 1.110               | 3.000                              | 89.096                           | 1.508               | 4.075                              | 89.096                           |
| 8         | 0.915               | 2.472                              | 91.568                           | 0.915               | 2.472                              | 91.568                           |                    |                                    |                                  |
| 9         | 0.714               | 1.930                              | 93.498                           | 0.714               | 1.930                              | 93.498                           |                    |                                    |                                  |
| 10        | 0.556               | 1.502                              | 95.000                           | 0.556               | 1.502                              | 95.000                           |                    |                                    |                                  |
| 11        | 0.414               | 1.119                              | 96.119                           | 0.414               | 1.119                              | 96.119                           |                    |                                    |                                  |
| … … …    | … … …               | … … …                             | … … …                            | … … …               | … … …                             | … … …                            |                    |                                    |                                  |
| 37        | 0.000               | 0.001                              | 100.000                          | 0.000               | 0.001                              | 100.000                          |                    |                                    |                                  |

Extraction Method: Principal Component Analysis.

The interpretation of the main determinants of sustainable development was made using the rotated component matrix presented in Table 3. The first component can be interpreted in terms of the amount of natural gas distributed for domestic use per inhabitant (0.917), the indicator having an important influence in assessing gas consumption to establish a correct policy in the field and is an essential component that characterizes the quality of life.

The second main component can be interpreted in terms of the amount of drinking water distributed to consumers for household use per inhabitant (0.926), the indicator assessing the quality of life and health of the inhabitants.
The third component can be interpreted in terms of the share of city streets length with sewerage network in the length of city streets (0.824), the indicator evaluating the measures taken by local government to develop local infrastructure and open the path to sustainable development. The indicator is a relevant measure of the specific objectives of the Europe 2020 Infrastructure Strategy. According to the Europe 2020 Strategy, Member States must “ensure the coordinated implementation of infrastructure projects within the EU’s core network, which make a decisive contribution to the efficiency of the EU transport system as a whole” [16].

The fourth component refers to the annual expenditures on active measures designed to reduce unemployment (0.826), while the fifth component can be interpreted in terms of access of the population to media and culture (0.805), evaluating in such a way the measures taken by the local administration in order to facilitate the access of the population to cultural services. The libraries are a link between culture and education. In the Europe 2020 Strategy, education is a key area for which there are specific objectives regarding the degree of inclusion in education of different categories of the population, school dropout, or lifelong learning.

The sixth component can be interpreted in terms of average number of students in primary and secondary education (including special education) per teacher (−0.818). The lower this indicator, the higher the quality of the educational process in terms of a proper qualification of teachers.

The seventh component can be interpreted in terms of enterprise birth rate (0.931), measuring, in a systemic way, the entrepreneurial intensity of the population living in a certain geographical area, and indicating the propensity (or its lack) of entrepreneurship in a certain geographical area.

Therefore, summarizing all information, we can mention that the main pillars that need to be monitored for advancing on the path of sustainable development are:

- Business environment through enterprise birth rate;
- Public services infrastructure through the amount of drinking water distributed to consumers for domestic use, the amount of natural gas distributed for domestic use, and the share of length of city streets with sewerage in length city streets;
- Education through the population access to information and culture and load degree of teachers;
- Social protection through active measures aiming at reducing unemployment and increasing employment.

In order to assess the quality of the results obtained from the MPCA, the KMO and Bartlett sphericity tests were applied. The value of the KMO statistic is 0.669 above the level of 0.5 indicating satisfactory results, while the statistical significance of the Bartlett test, with a probability below the 1% threshold (Approximate Chi-Square = 4251.77) shows that the correlation matrix is not the identity matrix (Table 4).

Table 4. Empirical results of the Bartlett test and KMO statistics.

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | Bartlett’s Test of Sphericity |
|-------------------------------------------------|-----------------------------|
| 0.669                                           | 4251.755                    |
|                                                 | 666                         |
|                                                 | 0.000                       |

In the last stage of the advancement composite index, the weights from the rotated matrix of the main components were considered, given that the square of the main components represent the proportion of the total variance of each factor. Each main component will receive its relative contribution in the total variance of all factors. The non-standardized advancement sustainable development index is determined as follows:

\[
non - std.\text{sustain}.develop.index = 39.16 PC1 + 15.58 PC2 + 7.92 PC3 + 7 PC4 + 4.33 PC5 + 3.38 PC6 + 3 PC7
\]  

(8)
The final value given to each county–year observation is rescaled using the percentile rank. In such a way, the advancement sustainable development index as a percentile ranking indicates how a county–year observation performs compared to other county–year observations at its position. The advancement index ranges from a low of 0 (lowest level of progress towards sustainable development) to a high of 100 (highest level of progress towards sustainable development). A ranking of 50 is an average performance.

Figure 4 points out the advancement made by the South-Muntenia counties region towards the desideratum of sustainable development in the period 2010–2017, revealing different types of county behaviour:

1. Counties with a relatively high value of the index for the entire period: Argeș, Prahova, and Dâmbovița.
2. Counties with some advancement, but with modest performance: Călărași, Ialomița, Teleorman, and Giurgiu.

Figure 4. The sustainable development index at the level of South-Muntenia region counties for the period 2010–2017.

The average scores of sustainable development index for South-Muntenia region counties revealed Prahova and Arges as leading poles while Giurgiu, Teleorman, and Calarasi are most likely considered to be lagging poles of sustainable development for South-Muntenia.

Even with these county disparities clearly highlighted, over the period 2010–2017, South-Muntenia registered a slowly but continuous advancement in terms of sustainable regional development, almost doubling its performance in these seven years (Figure 5).
4.2. Revealing the Main Sustainable Development Poles at County Level

In order to achieve this objective—to highlight the main sustainable development poles at county level—and to also analyze how these poles have been changed on the path of achieving sustainable development, a cluster technique has been applied.

Analyzing the values of advancement sustainable development index for the years 2010 vs. 2017, the existence of a strong upward trend can be seen, registered by all counties in the region.

In the trend analysis of sustainable development advancement, the trend diagram is delimited by the horizontal axis that marks the average value of the region, and the vertical axis that presents the trend. The two axes divide the area into four quadrants, revealing counties in the upper quadrant who are “moving forward” because both their value and trend are above the period average, while counties in the lower left quadrant “are still behind” because they are below average for both variables.

Although located on an increasing trend in terms of sustainable development, Prahova, Arges, and Dâmbovita counties exhibited a so-called stagnation over the period 2010–2017, registering a percentage increase of 30%, 42%, and 48%. The second upper quadrant does not include any county, so we can note that no county in the region has experienced a real move before (Figure 6).

In the lower quadrants, which mark the counties that are still behind, Ialomița and Teleorman registered an advancement over the period, but remain only halfway on the path to sustainable development. On the other hand, Teleorman and Giurgiu were the counties that are trying to recover the huge gap, with very low rates of sustainable development index.
Therefore, towards the desideratum of sustainable regional development, Arges, Prahova, and Dambovita could be considered as performance poles, even if in terms of advancement over the period 2010–2017 they are characterized by high performances rather than a stagnation stage (Figure 7).

**Figure 7.** Sustainable development trends in the South Muntenia region counties.

The analysis of the first three principal components representing the main components of public services infrastructure who recovered almost 63% from total variance, pointed out the following (Figure 8):

- **Ialomita** exhibited medium scores regarding the amount of natural gas and the amount of drinking water distributed to consumers for domestic use in both years 2010 and 2017, but poor scores in 2010 in terms of city streets share with sewerage network with a considerable advancement at the level of 2017;
- **Prahova** recorded very good scores in terms of the amount of natural gas distributed for domestic use per inhabitant and notable improvements for the other two components;
- **Dâmbovita** registered an advancement in terms of the amount of natural gas distributed for domestic use and of city streets share with sewerage network, but failed to develop the drinking water network distributed to household consumers for which it remains deficient;
- **Teleorman** rather exhibited a rebound over the period, recording a decline in the amount of natural gas distributed for domestic use and a small increase in the share of city streets with sewerage network;
- **Călărași** registered a remarkable advancement over the period, with low scores at the beginning of the period for the amount of natural gas and exhibited at the level of 2017 medium scores for all factors;
- **Giurgiu** recorded low scores in terms of the amount of natural gas and the amount of drinking water, scores that are maintained throughout the period and satisfactory scores in terms of the city streets share with network sewerage;
- **Arges** recorded satisfactory and good scores that improve over the analyzed period for all three main components.
development in that county is expected to increase and therefore also the overall level of county economic development. So that as their number compared to a teacher decreases, the level of education secondary education (including special education) per teacher—negatively impacts the level of because prob. > 10%.

Household use, per capita—does not showed a significant impact on the variation of GDP per capita, in several dynamic urban centers, basic services such as education, health, and functional land markets, water, and sewerage are essential and everyone must have access to them, regardless of location. Access to running water, gas, and sanitation should be considered top priorities, as this will make people more productive. Thus, some of the key investments in underdeveloped areas should focus on providing basic services to ensure similar living conditions throughout the country.

Therefore, even if the economic activity is not evenly distributed in the territory and is concentrated in several dynamic urban centers, basic services such as education, health, and functional land markets, water, and sewerage are essential and everyone must have access to them, regardless of location. Access to running water, gas, and sanitation should be considered top priorities, as this will make people more productive. Thus, some of the key investments in underdeveloped areas should focus on providing basic services to ensure similar living conditions throughout the country.

The empirical results of hierarchical cluster method based on all seven principal component scores obtained from the MPCA highlighted both leading poles and lagging poles for the South-Muntenia region (Figure 9), revealing that:

- Călărași and Ialomîța counties formed a distinct class in 2010 and this class been maintained also in 2017;
- Argeș formed a distinct class in 2010; in 2017, it approaches Prahova as a performance with which it forms a distinct class;
- Dambovița and Giurgiu each belonged to distinct classes in 2010, and at the level of 2017, they formed a common classes;
- Teleorman remained throughout the period in a distinct class.

**Figure 8.** Analysis of advancement recorded by the South-Muntenia region counties regarding the first three sustainable development drivers.

**Figure 9.** Main group of sustainable development clusters at the level of South-Muntenia region for 2010 vs. 2017.
4.3. Could the Main Determinants of Sustainable Regional Development Be the Leading Factors towards Economic Development of South-Muntenia Counties?

Therefore, after identifying the main determinants of sustainable development at the level of South-Muntenia region counties, a further research question was whether these drivers could be considered as leading factors for the economic development. In order to prove that, panel regression analysis was applied. Due to the relatively small sample size, seven specifications of the model have been estimated, one for each principal component, together with control variables (Table 5).

Based on the results of panel data analysis, different forecast scenarios based on stochastic dynamic simulations have been developed in order to highlight the future evolution of the county economic development proxy by GDP per capita for the period 2018–2020.

The simulations took into account the increase of the performance of each sustainable development factor depending on the absolute changes from one year to another as well as the absolute average change over the whole period, keeping the degree of urbanization and the population of the county capital unchanged at the level of the last year 2017.

In econometric models, the hypothesis of individual and/or random time effects was rejected. The analyzed process presents individual fixed effects for all models. The Redundant Fixed Effects Tests also reject the null hypothesis (fixed effects are redundant), both for individual effects and specific effects over time, and for the combination of individual fixed effects combined with specific effects over time in all seven models.

The empirical results revealed the statistically significant impact of sustainable development determinants previously identified by MPCA on the variation of GDP per capita. From all seven drivers of sustainable development, only one—the amount of drinking water distributed to consumers for household use, per capita—does not showed a significant impact on the variation of GDP per capita, because prob. > 10%.

From the six statistically significant determinants, only one—the number of students in primary and secondary education (including special education) per teacher—negatively impacts the level of development of the county, so that as their number compared to a teacher decreases, the level of education development in that county is expected to increase and therefore also the overall level of county economic development.

It is worth mentioning that, out of all determinants, the greatest impact was registered by the share of the city streets length with sewerage network, the annual expenditures with active measures to reduce unemployment and increase employment, and the amount of natural gas distributed for household use.

The share of the sewerage network in the length of city streets, one of the core aspects of public services infrastructure, is fundamental for the overall level of county economic development because it evaluates the measures taken by local government to develop local infrastructure and create the premises for economic development and shows the extent to which city streets are equipped on sewerage network.

On the other hand, the annual expenditure on active measures to reduce unemployment is important from the perspective of supporting and increasing employment through measures taken to reduce unemployment.

The amount of natural gas distributed for domestic use is another important aspect of public services infrastructure and has an important influence on the assessment of gas consumption in order to establish a correct policy in the field and is an essential component that characterizes the quality of life. All estimated models have been statistically significant, at 5% significance level, and the models’ coefficients were statistically significant. The impact of the variables control, county urbanization, and county capital population was positive and highly significant.
Table 5. Results of estimating panel regression models.

| Variables | Model I | Model II | Model III | Model IV | Model V | Model VI | Model VII |
|-----------|---------|----------|-----------|----------|---------|----------|-----------|
| C         | 10.663 * | 13.482 * | 5.452 *** | 7.448 ** | 14.047 * | 17.637 * | 11.257 *  |
| FACT1—The amount of natural gas distributed for domestic use | 0.076 ** |          |           |          |         |          |           |
| FACT2—the amount of drinking water distributed to household consumers |          | 0.010    |           |          |         |          |           |
| FACT3—the share of the length of city streets with sewerage network in the length of city streets |          |          | 0.094 *   |          |         |          |           |
| FACT4—annual expenditures with active measures to reduce unemployment |          |          |          | 0.077 *  |         |          |           |
| FACT5—the degree of access of the population to media and culture |          |          |          | 0.048 ** |         |          |           |
| FACT6—number of students in primary and secondary education (including special education)/teacher |          |          |          |          | -0.056 * |         |           |
| FACT7—enterprise birth rate |          |          |          |          | 0.030 ** |         |           |
| County capital population | 0.098 ** | 0.068 * | 0.037 ** | 0.072 * | 0.059 * | 0.073 * | 0.075    |
| Urbanization level | 0.047 | 0.218 * | 0.101 *** | 0.130 ** | 0.015 | 0.068 * |           |
| R-squared | 0.549103 | 0.567419 | 0.483020 | 0.596777 | 0.390636 | 0.476514 | 0.510186 |
| Adjusted R-squared | 0.523090 | 0.542462 | 0.453194 | 0.573514 | 0.355480 | 0.446313 | 0.481927 |
| S.E. of regression | 3.157475 | 3.427287 | 2.917511 | 2.531993 | 3.239939 | 3.214949 | 3.269278 |
| F-statistic | 21.10860 | 22.73621 | 16.19470 | 25.65365 | 11.1163 | 15.77802 | 18.05421 |
| Prob(F-statistic) | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000010 | 0.000000 | 0.000000 |

Note: * represents the statistical meaning at 1%, ** at 5% and *** at 10%.
From control variables significance, both urbanization level and county capital population have specific implications for economic development and their statistical significance preserved in almost all models. Density is a fundamental characteristic of urban settlements, with the development being closely linked to an increased urbanization. The long-term growth of a country implies the increase of economic and human capital in certain locations, where a higher density generates a more diverse capital reserve to support the satisfaction of supply and demand. Larger cities have a larger workforce, so they can support the local economy and grow faster than the rest of the country. This result has major implications for local and national policies and investments. For a fast-growing city, different solutions are needed than the recommended solutions for less developed areas or for cities that have reached an optimal level of agglomeration.

The empirical results of the simulations realized for each of the seven county and for all sustainable development determinants, keeping the same level of urbanization and the same county capital population for the short term of the last three years, 2018–2020, are displayed in Figure 10. It is worth mentioning that the amount of drinking water distributed to consumers for household use (FACT2) who did not exhibited a significant impact on GDP per capita, it has not been included in the forecast scenarios.

The empirical evidence highlighted that:

- Argeș and Călărași counties should focus on increasing the amounts allocated to active measures to reduce unemployment combined with to length increase of city streets with sewerage network;
- Ialomita, Dâmbovita, and Teleorman counties should focus primarily on improving the share of city streets length with sewerage network and secondary on increasing the expenditures associated with the active measures for reducing employment;
- Prahova and Giurgiu must channel their efforts on increasing the amounts allocated to active measures to reduce unemployment together with the reduction of primary and secondary school students per teacher;
- Prahova and Argeș were considered as leading poles of economic development for the South-Muntenia region for the forecast horizon 2018–2020.

4.4. Shedding Light on Driving Forces of Sustainable Regional Development. Implications for Regional Development Strategies

Romania is organized in eight main development regions, comprising 42 counties together with the Bucharest Municipality summing up 320 cities from which 103 municipalities, 2861 communes, and 12,957 villages.

The development region is a concept of association of counties to facilitate their development in an integrated and balanced manner. The Development Region is an area that includes the territories of several counties constituted on the basis of agreements concluded between the representatives of the county councils, but also the framework for the elaboration, implementation, and evaluation of regional development policies, as well as collection of specific statistical data. Development regions are not united administrative territorial and do not even have legal personality.

In Romania, development regions represent the framework for elaborating, implementing, monitoring, and evaluating regional development policies, including the regional development strategies and economic and social cohesion programs.

The importance of investigating the advancement of a region towards sustainable development resides also in the fact that for the programming period 2014–2020, part of the structural funds, has been accessed at regional level through different programs provided by the Regional Development Agency. Therefore, the main question that it raises is: Have the funds allocated by different programs led to an advancement in the sustainable regional development target?

Now, at the end of the programming period 2014–2020, this question becomes even more important. Therefore, it is essential to explain how the main determinants of sustainable regional development
can be integrated in regional development policies in order to continuously support the development of the Romanian regions.

Romanian regional development relies mainly on the following levels:

- County level, through County council with executive role;
- Regional level, through the Council for Regional Development with decision-making role and the Agencies for Regional Development with executive role;
- National level, through the Council for Regional Development with decision-making role and the Ministry for Regional Development and Public Administration with executive role.

At the South-Muntenia region level, Regional Development Agency and County Councils have the main role in stimulating social and economic development towards a balanced and sustainable region, by developing and implementing strategies and programs, attracting investments and promoting the region internally and externally.

As an Intermediate Body for the Regional Operational Program 2014–2020, the agency manages the funds allocated for the region, in the fields of transport infrastructures, tourism, business support infrastructures and services, social services, and urban development. As far as the regional projects are concerned, the agency acts as leader or partner in large-scale projects aiming at the socio-economic development of the region as a whole.

At the national level, the regional development has been supported through:

- National Strategy for Regional Development 2014–2020;
- National Strategy for Sustainable development 2030;
- National Development Plan 2014–2020;
- National Reform Programme 2019;
- Regional Operational Program (ROP) 2014–2020.

An integral part of the national economy, the South-Muntenia Development Region proposed a set of priorities, which are in line with the fundamental objective set by The Europe 2020 strategy to promote smart, sustainable, and inclusive growth, as well as in national targets defined for the main areas of activity.

At the regional level, the regional development has been supported through:

- Development strategy of the South Muntenia Region 2014–2020;
- Regional Development Plan of South-Muntenia 2014–2020;
- Smart specialization strategy for South-Muntenia;
- South-Muntenia County Development plan.

Another tool that has strongly supported regional development, even if it was controlled at the central level, was the Regional Operational Program 2014–2020 who had allocated European funds of 6.8 billion euros. For the new programming exercise, 2021–2027, the government plans to give maximum power to local leaders over European regional funds of billions of euros by the division of the Regional Operational Program by regions.

For the future European funds, from the programming period 2021–2027, the Regional Operational Program will be divided into eight smaller regional programs, one for each development region of the country. According to the proposal, the Ministry of European Funds and the Regional Development Agencies (RDAs) would become managing authorities of these funds. Until now, these funds were largely controlled at the central level, through the ROP Management Authority 2014–2020, from the Ministry of Public Works, Development, and Administration (MLPDA). Therefore, for the new programming period, South-Muntenia will have a specially designed Regional Operational Program that will better support the regional development of the region counties.

Figure 11 presents, in a synthetic way, how the determinants of sustainable regional development of South-Muntenia could be incorporated supporting part of the objectives of regional development strategies and policies.
Figure 10: Comparisons between different scenarios of evolution of South Muntenia county economic development for the period 2018–2020 based on the impact of sustainable development determinants.
Figure 11. Sustainable regional development driving forces for South-Muntenia. Implications for regional development strategies.
Sustainable development determinants such as business environment, public services infrastructure, education, and social protection could strongly support the main objectives of *South-Muntenia Development Strategy*, a fundamental strategic document enhancing “the growth the region’s capacity for sustainable and balanced economic and social development a leading to a reduction in disparities and an increase in economic cohesion to increase the prosperity and standard of living of the inhabitants of the region”.

More in depth, the driving forces of sustainable regional development could support the achievement of the following goals of the strategy:

- **Objective 1**—increasing the level of competitiveness and attractiveness of the region.
- **Objective 2**—increasing the innovative capacity and competitiveness of the business environment of the region.
- **Objective 3**—sustainable and balanced economic, social, and cultural development of urban communities.
- **Objective 4**—increasing social stability and streamlining the workforce potential.

Also, the determinants of sustainable regional development could support the objectives of *Smart Specialization Strategy*, aiming to spur sustainable and competitive development in the medium term. The implementation of the strategy in sectors and key fields identified at regional level as core areas of smart development, shall influence the economic region as follows:

- Increase the level of research, development, and technological innovation and generate competitive products and services, with high added value;
- Generate competitive products and services, both internally and externally, in addition to related activities that favor inclusion;
- Stimulate research, development, and innovation activities and technological transfer and in the other regional economy’s branches;
- Increase region attractiveness for external markets as well as production and trade;
- Creation of a favorable context for sustainable development at regional and national level.

Therefore, the determinants sustainable regional development could strongly support the following objectives of Smart Specialization Strategy:

- **Objective 1**—competitive regional economy based on innovation by supporting the creation and development of new businesses and business support structures.
- **Objective 2**—develop and maintain highly skilled human capital in the region by improving the quality and efficiency of higher education in the region and attracting highly skilled human capital in the region.

The drivers of sustainable regional development could also contribute to achieving the objectives of the first Regional Operational Program for South-Muntenia 2021–2027, a strategic programming document covering the areas: Smart specialization and innovation, SMEs, digitalization, energy efficiency, urban development, mobility and connectivity, biodiversity, educational infrastructure, tourism, and culture/cultural heritage, who are not connected to another operational program in the same sector (there is no hierarchical subordination) and who support the Program Strategy for the sustainable and balanced development of the region.

More in depth, the determinants of sustainable regional development could offer a valuable contribution in achieving the following objectives:

- **Objective 1**—research and innovation capacity building and adoption of advanced technologies;
- **Objective 2**—boosting the growth and competitiveness of SMEs and improving access to quality and inclusive services in education, training, and lifelong learning through infrastructure development.

The sustainable development determinants could also help to the achievement of the objectives of *Regional Development Plan*, an important document reflecting economic, social, and environmental
development policies, taking into account the National Reform Plan and the objectives of Europe 2020 Strategy.

Therefore, the main determinants of sustainable development could support the achievement of the following specific objectives of the Regional Development Plan:

- Objective 1—developing the mobility and connectivity of the population, goods, and related services, in order to promote sustainable development,
- Objective 2—growing of the regional economy by stimulating the competitiveness of domestic SMEs, developing human capital by increasing access to and participation in education and training, throughout life, and stimulating employment.

In conclusion, starting from the core objective of all programs—the regional development of South-Muntenia—it is fundamental to mention that only targeted investments based on the principle of force concentration directed towards sustainable development drivers could lead to a truly viable regional development of South-Muntenia.

The aggregated results at the level of South-Muntenia GDP per capita highlighted the fundamental importance of two sustainable regional development drivers on the path regional economic development—allocating more funds for active measures having as target the reduction of unemployment together with a better infrastructure of public services (an increase in the length of city streets with sewerage network) (Figure 12).

![Figure 12. South-Muntenia region economic development for the period 2018–2020 based on forecast scenarios of sustainable development determinants.](image-url)

4.5. Highlighting Local Initiatives Promoting Sustainable Regional Development

National, regional, and local administrations play an important role in promoting sustainability in the economic, social, and environmental activities, in a coherent manner. In addition to the strategies and programs implemented at European and national level, there are some local initiatives, too. The initiatives of the local administrations are materialized in various projects aim at achieving the objectives of sustainable development. In addition to the goals of sustainable development, an important goal of local policies is meeting human needs and providing a better quality of life. The lack of continuity of national and local development programs creates bottlenecks and ruptures in pursuing sustainable development goals. At the level of the South-Muntenia region, some projects proposed at national level are implemented at local level, but projects proposed there are also projects proposed and implemented at the county and local level.

In order to achieve the regional development objectives in Romania and specifically in the South-Muntenia Region, the following procedures are implemented: EUROPE 2020 Strategy, National Strategy for Regional Development, Regional Operational Program (ROP), and Regional Development Plan 2014–2020 of the South-Mountain Region, correlated with the EU cohesion policy.
The Regional Operational Program (ROP) 2014–2020 has changed the appearance of the counties in the South-Muntenia region considerably; one year before ending the current programming period, the region handled more than 1170 applications for funding under the 13 priority axes. The most requested investments were reflected in the sector of business development and in the improvement of regional road infrastructure.

The ROP emphasized the development and improvement of the regional transport infrastructure, allocating over one billion lei. Infrastructure projects aim at safety and traffic flow, increasing the mobility of people, easy and fast access to health, education, or social services, as well as the adaptability of the population to the needs of the workforce. Investments for the development of the road network aimed at achieving interdependent objectives: Connectivity to the TEN-T network also led to the development of trade, increasing the competitiveness of the territories served, thus having an important contribution to the development of the region.

In addition to these procedures, there are a number of local initiatives aimed at implementing community development projects. The mission of these initiative groups is to become tools of work and dialogue between citizens and local authorities to solve community problems in various fields such as: Economy, education, agriculture, social field, and public administration.

The county seat municipalities in South Muntenia benefit from over 200 million euros to implement projects that propose integrated solutions, which respond to the challenges posed by environmental pollution, urban spaces degraded by marginalized communities, or education.

An important pillar for regional sustainable development is represented by education and culture, which benefit from numerous initiatives at local level, also in the South-Muntenia region.

Most projects in the South Muntenia region were submitted on Priority Axis 2—improving the competitiveness of small and medium enterprises—and Investment priority 2.1—promoting entrepreneurship; 39 projects with a total value of 41.55 million lei.

An important pillar in which Romania and the South-Muntenia Region is deficient is represented by the expansion of quality public utility networks and increasing the degree of connection of the population to them and in areas where it does not exist, as well as those for collection, selection, and waste storage; the realization of the necessary infrastructures for the prevention or diminution of the effects of the manifestation of natural risks. At the level of all seven counties, one of the weak points is represented by incomplete and used public utility infrastructure. Table A2 (Appendix A) presents an overview of local initiatives in the South-Muntenia Region, representing viable alternatives promoting sustainable regional development.

4.6. A Brief Overview of the Main Empirical Results

Summarizing the most relevant empirical results, we can mention that:

Hypothesis 1 was supported by the empirical results of Principal Components Analysis, according to which public services infrastructure represents the first three components (natural gas distributed for domestic use per inhabitant, amount of drinking water distributed to consumers for household use per inhabitant, and the share of city streets length with sewerage network) of sustainable regional development;

Hypothesis 2 was supported by the empirical results of Principal Components Analysis, according to which social protection represents the fourth and fifth components of sustainable regional development;

Hypothesis 3 was supported by the empirical results of Principal Components Analysis, according to which education represents the sixth component of sustainable regional development;

Hypothesis 4 was supported by the empirical results of Principal Components Analysis, according to which business environment represents the seventh component of sustainable regional development;

Hypothesis 5 was supported by the values of the composite index, according to which over the period 2010–2017, South-Muntenia recorded a continuous advancement in terms of sustainable regional development, almost doubling its performance in these seven years;
Hypothesis 6 was only partially supported by the positive and highly significant coefficients of natural gas distributed for domestic use per inhabitant and the share of city streets length with sewerage network, as public services infrastructure. The hypothesis was not supported by the lack of significance of drinking water distributed to consumers for household use.

Hypothesis 7 was supported by the positive and highly significant coefficient of social protection expenditures, contributing to regional economic development.

Hypothesis 8 was supported by the positive and highly significant coefficients of the population access to media and culture, as well as by the quality of the education, contributing to regional economic development.

Hypothesis 9 was supported by the positive and highly significant coefficient of the enterprise birth rate, contributing to regional economic development.

These hypotheses support both the idea of sustainable regional development and regional economic development. Economic development is achieved by implementing development policies, at national, regional, and local level, taking into account the principles of sustainable development. Therefore, sustainable regional development has an essential role in establishing regional development policies, essential for redefining the economic, socio-cultural role, and political entities in a changing continental and global context.

5. Main Conclusions and Policy Implications

For a state to achieve sustainable development, effective tools are needed in order to facilitate the sustainability management process, allowing the implementation of numerous strategies and programs. These programs must be implemented in a pyramid system, from the highest level to the lowest administrative structures. At the EU level, European Strategy 2020 and European strategy are implemented for sustainable development. At the level of Romania, sustainable development is implemented through National Strategy for Regional Development 2014–2020, Regional Operational Program 2014–2020, National Strategy for Sustainable Development 2030, National Development Plan 2014–2020, and National Reform Program 2019. For a more efficient implementation, regulations at regional level are also needed, especially since at EU level there are very large gaps between regions.

In Romania, development regions express the framework for elaborating, implementing, monitoring, and evaluating regional development policies, including the regional development strategies and economic and social cohesion programs.

At the regional level, in Romania, Regional Development Strategy 2014–2020 of Southern Muntenia and Regional Development Plan 2014–2020 of South-Muntenia are in force as main regional strategic policies together with Smart Specialization Strategy for South-Muntenia and County Councils Development Plans 2014–2020 for each county of the region. For the next period, 2021–2017, a new dedicated strategic program for South-Muntenia-Regional Operational Program will mainly support programs covering the following areas: Smart specialization and innovation, SMEs, digitalization, energy efficiency, city, mobilization and connection, biodiversity, culture, infrastructure/cultural heritage. Taking into account national, regional, and local needs, granted projects will ensure the strategic program for sustainable use and balancing of South-Muntenia region.

In Romania, the development region represents the framework for elaborating, implementing, monitoring, and evaluating regional development policies. The main regional strategic programs that regulated the regional development are Regional Development Strategy 2014–2020 of Southern Muntenia and Regional Development Plan 2014–2020 of South-Muntenia, with the contribution of Smart Specialization Strategy for South-Muntenia and County Councils Development Plans 2014–2020.

For the new programming exercise, 2021–2017, the South-Muntenia region will benefit from a new dedicated strategic program—Regional Operational Program—with the core objective of supporting the regional development of South-Muntenia and covering areas such as smart specialization and innovation, SMEs, digitalization, energy efficiency, city, mobilization and connection, biodiversity, culture, and infrastructure/cultural heritage.
In the context of completion of the programming period for most of the strategic regional programs and in the view of the new period of programming, 2021–2027, knowing where South-Muntenia is positioned on the path to sustainable regional development and how the main determinants of sustainable regional development can be integrated in regional development policies in order to continuously support the development of Romanian regions becomes even more important.

Therefore, the paper aimed to evaluate the progress made by the South-Muntenia region towards regional sustainable development for the period 2010–2017 highlighting the main implications for regional development strategies and revealing local initiatives promoting broader sustainable regional development.

Where is the South-Muntenia region on the path of sustainable regional development and what are the main implications for regional development? These have been the main questions of our research.

In attempting to answer these questions, the main determinants of sustainable regional development at the level of South-Muntenia region counties have been identified using multiple principal component analysis (MPCA) and an advancement sustainable development index based on panel data for the period 2010–2017 have been developed. In such a way, the advancement recorded by region counties during the period 2010–2017 have been highlighted and the distance still to be travelled to achieve the desideratum of sustainable development has been evaluated.

In order to analyze the advancement on the path of sustainable regional development, the research relied on the seven counties of South-Muntenia region, namely Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova, and Teleorman, analyzed over the horizon 2010–2017 putting together all three dimensions of sustainable development: Social, economic, and environmental.

The empirical results highlighted the existence of seven determinants of sustainable regional development in four pillars:

- Business environment through entrepreneurial capacity;
- Public services infrastructures through the amount of drinking water distributed to consumers for household use, the amount of natural gas distributed for household use, and the share of city streets length with sewerage network along total city streets;
- Education through the degree of population access to information and culture and the number of students in primary and secondary education (including special education) distributed to a teacher;
- Social protection through expenditures made with active measures aimed at reducing unemployment and increasing employment.

The empirical results of the sustainable development composite index pointed out that over the period 2010–2017, South-Muntenia recorded a slowly but continuous advancement in terms of sustainable regional development, almost doubling its performance in these seven years.

Also, the main sustainable development poles at the county level for the year 2017 have been highlighted using the clustering technique.

Analyzing the county performances, it can be mentioned that Prahova and Argeș had the behavior of leading poles while Giurgiu, Teleorman, and Calarasi are most likely considered to be lagging poles of sustainable development for South-Muntenia.

The results of trend diagram revealed that, although located on an increasing trend in terms of sustainable development, Prahova, Argeș, and Dâmbovița counties exhibited, over the period 2010–2017, a so-called stagnation, while Ialomița and Teleorman were still behind, registering an advancement over the period but remain only halfway on the path to sustainable development. On the other hand, Calarasi and Giurgiu were the counties that are trying to recover the huge gap, with very low rates of sustainable development index.

Analyzing the way in which the main determinants of sustainable regional development could be integrated into regional development policies, the main conclusion highlighted the fact that the only solution in achieving the core objective of all regional programs—the regional development
of South-Muntenia—is the targeted investments based on the principle of force concentration directed to sustainable development drivers, who could lead to a truly viable regional development of South-Muntenia.

Investigating how the main determinants of sustainable regional development could be the leading factors towards economic development of South-Muntenia counties, the empirical results revealed the fundamental influence of public services infrastructures—through the share of the city streets length with sewerage network and the amount of natural gas distributed for household use, social protection measures through increases in active measures expenditures aiming to reduce unemployment, education through access of the population to media and culture and a smaller load degree of students-teachers as well as business environment through birth rate of enterprises.

Simulating the overall level of economic development of region counties for the years 2018–2020, the fundamental importance of two sustainable regional development drivers on the path towards regional economic development has been highlighted—allocating more funds for active measures with the target of the reduction of unemployment, together with a better infrastructure of public services (an increase in the length of city streets with sewerage network).

Analyzing the way in which the main determinants of sustainable regional development could be integrated into regional development policies, the main conclusion highlighted the fact that the only solution in achieving the core objective of all regional programs—the regional development of South-Muntenia—is the targeted investments based on the principle of force concentration directed to sustainable development drivers, who could lead to a truly viable regional development of South-Muntenia.

National, regional, and local administrations play an important role in promoting sustainability in the economic, social, and environmental activities, in a coherent manner. In addition to the strategies and programs implemented at the European and national level, there are some local initiatives. The initiatives of the local administrations are materialized in various projects that aim at achieving the objectives of sustainable development. In addition to the goals of sustainable development, an important goal of local policies is meeting human needs and providing a better quality of life. The lack of continuity of national and local development programs creates bottlenecks and ruptures in pursuing sustainable development goals. At the level of the South Muntenia region, some projects proposed at the national level are implemented at the local level, but there are also projects proposed and implemented at the county and local level.

In the final section of our research, an overview of local initiatives promoting sustainable regional development have been presented, with the mission of becoming tools of work and dialogue between citizens and local authorities to solve community problems in various fields, such as economy, education, agriculture, social field, and public administration.

Local initiatives could represent viable alternatives for supporting sustainable regional development given the fact that both beneficiary and local authorities know best the existing need at local level and the decision needs to be as close as possible to the beneficiary and the beneficiary to have as few steps as possible to implement its financing project, avoiding the excessive bureaucracy.

Regardless of the level at which development policies are designed, local, county, or regional, they must take into account and monitor the sustainable development determinants if the ultimate goal is the overall regional development of South Muntenia.

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## Appendix A

**Table A1.** Overview of the local initiatives in South Muntenia Region.

| Project | Objective | Pillars | Impact | Status |
|---------|-----------|---------|--------|--------|
| SinCE-AFC “Strengthening the entrepreneurial spirit of SMEs in the agri-food chain in the transition to the circular economy” in Călărași and Prahova | Creating new jobs | Involvement of SMEs in the agri-food chain in the circular economy by promoting appropriate horizontal financial and management mechanisms. | Ongoing |
| New Start in Călărași and Teleorman | Creating new jobs | ✓ was organized in April 2016 the Center for shelter for mother and child subjected to domestic violence, Roșiorii de Vede, Teleorman County; ✓ 2 trainers from ADR South Muntenia took the course for women victims of domestic violence; ✓ 13 women victims of domestic violence were housed in the center participated in the course; ✓ 5 participants improved their personal and professional skills; ✓ 1 participant managed to find a temporary job, abroad, in agriculture. | Completed |
| Access 360 | Creating new jobs | ✓ starting their own business by the members of the target group ✓ professional retraining courses | Ongoing |
| Project | Objective | Pillars | Impact | Status |
|---------|-----------|---------|--------|--------|
| Start up Sud Muntenia in Dambovita and Targoviste | Supporting entrepreneurship and increasing managerial and entrepreneurial skills in the South Muntenia region, as an opportunity for business development, including innovative SMEs and employment. | Creating new jobs | ✓ created 72 jobs; ✓ created 36 functional natural or legal persons; ✓ 300 people received support; ✓ 150 people wanted to develop an entrepreneurial project; ✓ 150 people inactive or unemployed | Ongoing |
| Large Infrastructure Operational Program (POIM) in Valcea, Teleorman, Giurgiu, Calarasi, and Arges | Sustainable growth by promoting a low-carbon economy through energy efficiency measures and the promotion of green energy, as well as by promoting environmentally friendly modes of transport and more efficient use of resources. | Creating new jobs; Gas, water and energy | ✓ 3 Upgraded transformer stations/new operational for takeover energy produced from renewable sources; ✓ new water projects | Ongoing |
| “Extension of the public water and sewerage network—Tuicani neighborhood”, Moreni, county Arges | Development of water and sewerage network | Gas, water and energy | ✓ Extension of the public water and sewerage network | Completed |
| Joint risk management for effective responses of local authorities in emergency situations, Calarasi | Developing an online platform to provide information for crisis prevention and management, such as the purchase of equipment specific to emergency response. | Gas, water and energy | ✓ Training activities in the field of crisis prevention in the cross-border region | Ongoing |
| Increasing the institutional capacity for the coordinated national development of palliative care and home care Teleorman | Creating and introducing an uniform and fluent mechanism for planning, developing, evaluating and monitoring a national system of palliative care and general home care, in the sense of health care and personal care services (basic activities of daily living and instrumental activities of daily life), to provide assistance to people suffering from progressive or incurable chronic diseases, and those with a high degree of dependence. | Creating new jobs | ✓ Training and education of decision-making and enforcement staff within central and local authorities for palliative care and monitoring of the quality of services in the field of palliative care | Ongoing |
| Project                                                                 | Objective                                                                 | Pillars        | Impact                                                                 | Status       |
|------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------|------------------------------------------------------------------------|--------------|
| Rehabilitation of urban public infrastructure, Sinaia city—“ZINO—A to Z Education” Multifunctional Educational and Recreational Center | Rehabilitation of urban public infrastructure.                           | Education      | ✓ Rehabilitation of urban public infrastructure                       | Completed    |
| Arrangement of the public garden “Parc Știrbei”—“ZINO—A to Z Education” Multifunctional Educational and Recreational Center | Revitalization of the city.                                               | Education      | ✓ Arrangement of the public garden “Parc Știrbei”                       | Ongoing      |
| Initiative for my community, Giurgiu—“NoNEETs—Permanent Training and Assessment Programme to NEETs Young Adults for their inclusion in the labour market and EU society” | Increasing the degree of active involvement of young people (high school and university students aged 16 to 24) in the public life of their local community. | Education      | ✓ Solving community problems in various fields such as: economy, education, agriculture, social field, public administration. | Completed    |
| Start-Up Plus project—Arges; Calarasi; Dambovita; Giurgiu; Ialomita; Prahova; Teleorman. | Developing entrepreneurship in the South Muntenia region and improving the level of managerial and entrepreneurial skills as an opportunity for business development and employment. | Creating new jobs | ✓ Promoting sustainable and quality jobs and supporting worker mobility | Ongoing      |
| Ensuring the utilities and services necessary for the operation of OIR POSDRU South Muntenia Region | Providing the necessary utilities and services.                           | Gas, water and energy | ✓ Providing the necessary utilities and services                       | Completed    |
| The program regarding the paving of the roads and the water supply of the villages, approved by the Government Decision no. 577/1997, Calarasi | Providing water supply.                                                   | Gas, water and energy | ✓ Water supply                                                          | Completed    |
Table A1. Cont.

| Project                                                                                           | Objective                                                                 | Pillars                                      | Impact                                      | Status               |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------|----------------------|
| Rehabilitation of urban public infrastructure, Sinaia city—“ZINO—A to Z Education” Multifunctional Educational and Recreational Center | Rehabilitation of urban public infrastructure.                             | Education                                    | ✓ Rehabilitation of urban public infrastructure | Completed            |
| The program for rehabilitation and extension of water and wastewater infrastructure, approved by Government Ordinance no. 40/2006, Calarasi | Rehabilitation and extension of water and wastewater infrastructure.       | Gas, water and energy                         | ✓ Rehabilitation and extension of water and wastewater infrastructure | Completed            |
| The infrastructure development program in the rural area, approved by Government Ordinance no. 7/2006, Calarasi | Infrastructure development program in the rural area.                     | Gas, water and energy                         | ✓ Infrastructure development                | Completed            |
| The program regarding the paving of the roads and the water supply of the villages, approved by the Government Decision no. 577/1997, Calarasi | Paving of the roads and the water supply of the villages.                 | Gas, water and energy                         | ✓ Paving of the roads and the water supply of the villages | Completed            |

Table A2. The rotated component matrix.

| Component                                                                                   | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|---------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|
| Zscore: The degree of connection of the population to sewerage and wastewater treatment systems | 0.421| 0.649| 0.550| 0.103| 0.138| 0.174| 0.067|
| Zscore: Equipping local communities with volumes available to the general public            | 0.322| 0.703| 0.060| -0.140| 0.558| -0.105| 0.046|
| Zscore: The degree of access of the population to media and culture                         | 0.140| -0.114| 0.191| -0.279| 0.805| 0.330| -0.139|
| Zscore: Active readers per 1000 inhabitants                                                  | 0.544| 0.098| -0.266| -0.229| 0.495| 0.511| -0.105|
| Zscore: Visitors to museums and public collections per 1000 inhabitants                      | 0.855| 0.325| 0.200| 0.056| -0.051| -0.096| 0.038|
| Zscore: Employed civilian population                                                        | 0.807| 0.365| 0.213| -0.102| 0.017| 0.334| -0.068|
| Zscore: Registered unemployed persons/100 employees                                          | -0.470| -0.318| -0.558| -0.130| -0.197| 0.504| -0.066|
| Zscore: Monthly real average gross earnings                                                  | 0.459| 0.187| 0.591| 0.423| -0.025| 0.013| 0.290|
| Zscore: The living space existing at the end of the year/per inhabitant                      | 0.415| -0.037| 0.493| 0.599| -0.051| 0.144| -0.128|
| Zscore: The degree of renewal of the housing stock                                           | 0.476| -0.027| 0.225| -0.301| 0.709| -0.145| -0.029|
Table A2. Cont.

| Component                                                                 | 1   | 2    | 3   | 4   | 5   | 6    | 7   |
|---------------------------------------------------------------------------|-----|------|-----|-----|-----|------|-----|
| Zscore: Capacity of drinking water production facilities per capita       | −0.155 | 0.369 | 0.321 | 0.129 | 0.470 | 0.185 | 0.221 |
| Zscore: The amount of drinking water distributed to household consumers/ per inhabitant | 0.196 | 0.926 | 0.058 | −0.014 | 0.130 | −0.051 | 0.002 |
| Zscore: The amount of natural gas distributed for domestic use/ per inhabitant | 0.917 | 0.295 | 0.107 | 0.035 | 0.122 | −0.045 | 0.053 |
| Zscore: Share of modernized streets length in total length of city streets | 0.361 | 0.007 | 0.734 | 0.138 | 0.201 | 0.158 | −0.081 |
| Zscore: Share of city streets length with water network in the length of city streets | 0.128 | 0.280 | 0.198 | 0.323 | 0.758 | 0.234 | 0.112 |
| Zscore: Share of city streets length with sewerage network in the length of city streets | −0.053 | −0.304 | 0.824 | 0.272 | 0.149 | 0.146 | 0.006 |
| Zscore: Share of city streets length with gas network in the length of city streets | 0.734 | −0.456 | 0.099 | 0.149 | 0.392 | 0.053 | −0.072 |
| Zscore: Area of municipalities and cities covered with green spaces per capita | 0.207 | 0.829 | −0.283 | 0.163 | −0.338 | −0.023 | 0.096 |
| Zscore: Cars registered per 1000 inhabitants                               | 0.643 | 0.236 | 0.592 | 0.318 | 0.138 | 0.144 | 0.078 |
| Zscore: Infant mortality rate                                              | −0.480 | 0.116 | −0.175 | −0.565 | 0.019 | −0.224 | 0.032 |
| Zscore: The natural increase rate of the population                        | −0.282 | −0.124 | −0.107 | −0.027 | 0.703 | −0.571 | −0.040 |
| Zscore: Average lifespan                                                   | 0.687 | 0.260 | 0.238 | 0.543 | 0.114 | 0.243 | 0.003 |
| Zscore: Number of emigrants                                                | 0.640 | 0.243 | 0.116 | 0.455 | −0.368 | 0.203 | 0.013 |
| Zscore: Population access to family medicine                               | 0.350 | 0.188 | 0.358 | 0.153 | 0.353 | 0.713 | 0.026 |
| Zscore: Population access to hospitals                                     | 0.194 | 0.758 | 0.464 | −0.073 | −0.122 | 0.320 | −0.008 |
| Zscore: Access of the population to the doctor - exclusively dentist       | −0.320 | −0.362 | −0.476 | −0.070 | −0.093 | −0.681 | 0.060 |
| Zscore: Primary and secondary school students (including special education) who return on average to a teacher | 0.167 | 0.473 | −0.079 | 0.041 | −0.059 | −0.818 | 0.054 |
| Zscore: Gross enrollment rate of children in preschool education           | 0.015 | 0.321 | −0.084 | −0.713 | 0.578 | 0.026 | 0.033 |
| Zscore: Load degree of a teacher in preschool education                    | 0.167 | 0.642 | −0.189 | −0.573 | 0.237 | −0.227 | 0.124 |
| Zscore: Primary and secondary school students (including special education) who return on average to a teacher | −0.523 | 0.189 | −0.190 | −0.331 | −0.025 | −0.164 | 0.370 |
| Zscore: Density of enterprises                                              | 0.422 | 0.529 | 0.702 | 0.056 | 0.039 | 0.035 | 0.049 |
| Zscore: Density of authorized individuals                                   | 0.803 | 0.406 | 0.086 | 0.081 | 0.248 | −0.021 | 0.147 |
| Zscore: Birth rate of enterprises                                           | −0.113 | −0.056 | −0.041 | −0.138 | 0.001 | 0.037 | 0.951 |
| Zscore: Business death rate                                                | −0.070 | −0.091 | −0.023 | −0.797 | −0.001 | 0.018 | −0.356 |
| Zscore: Retirees/Employees                                                 | −0.543 | −0.700 | −0.153 | −0.301 | 0.140 | −0.140 | −0.108 |
| Zscore: Monthly average pension from public social insurance               | 0.739 | 0.326 | 0.313 | 0.262 | −0.072 | 0.063 | 0.273 |
| Zscore: Annual expenditure on active measures to reduce unemployment       | 0.150 | 0.111 | 0.267 | 0.826 | 0.012 | −0.306 | 0.004 |

Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 29 iterations.
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