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MODEL FOR ANALYSIS AND EVALUATION OF SUSTAINABLE CITIES IN BULGARIA IN THE CONTEXT OF LOCAL PUBLIC POLICY APPLIANCE

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Abstract. *In recent years, the digitalization of the economy and the increasing demand for resources have created several challenges for developing countries, their regions, and urban agglomerations. Therefore, many governments have undertaken significant changes in the policies applied to developing regions and cities. These new concepts are aimed at gradually building sustainable and smart cities. This is the response of countries to new challenges such as the digital environment, combating climate change, and maintaining favorable living conditions due to the strong environmental and socio-economic degradation. In this regard, the authors set as their main research objective to analyze and assess the sustainability of cities and the surrounding territory by implementing sustainable development policies at all levels. A major task and difficulty for the authors is to build upon and refine a model that can be used to assess sustainable and smart cities. In this paper, the authors propose an approach to studying sustainable cities, thus evaluating the effects of policies implemented in this field. The model includes the main groups of indicators that are used to analyze the sustainable and smart development of municipalities in the Northeast region of Bulgaria. Based on these indicators, data is collected, and processed, and comparative and statistical analysis is carried out to assess their sustainability and intelligence. The authors reach important conclusions such as an unsatisfactory level of sustainable and intelligent development, although the environment and conditions at the national level are favorable. In fact, in Bulgaria, based on the assessment of the studied municipalities in the Northeast region, it is clear that we cannot talk about sustainable cities because Bulgarian municipalities are still at the beginning of this development path.*

Keywords: *smart development, territorial sustainability, sustainable development, sustainable and smart cities, Bulgaria.*

Reikšminiai žodžiai: *išmanioji plėtra, teritorinis tvarumas, tvarus vystymasis, tvarūs ir išmanūs miestai, Bulgarija.*

Introduction

Sustainable development is not a new concept, but it has gained significant importance in the last decade in the context of combating climate change. In this direction, the European Union has embarked on a transition towards a carbon-neutral economy by 2050, with the Green Deal between European countries. The policies and measures set out are aimed at improving living conditions in urban areas and large cities, as well as initiatives to clean up and protect the environment. The policies thus described are mainly targeted at urbanized urban areas, where the production facilities that pollute the natural and urban ecosystems are usually located. Therefore, in urban urban areas, policies toward achieving a climate-neutral environment, including economic neutrality, are beginning to be implemented. In this context, it becomes very important to manage the territory and the urban economy to achieve sustainable results, which also includes the rational use of available resources, energy-independent buildings, the development of environmentally friendly transport, the implementation of intelligent management systems for buildings, homes, and waste, the use of environmentally friendly, recycled or environmentally friendly materials in construction, etc. Here we have a classic problem where, depending on how we want to look at the problem, we can see the glass as either half full or half empty. On the one hand, it is encouraging that public institutions in Bulgaria, at the local level, feel the need to use new technologies to make their internal processes more efficient and offer better services to citizens and companies. On the other hand, without a functional national framework for interoperability, common standards, and clear rules for interconnection, the specific solutions of different public institutions (and sometimes departments within these organizations) experience difficulties in communicating with each other, data exchange is difficult or impossible, data duplication is the norm and integrating these islands of e-government into a coherent national system will be difficult. This shows that a national vision of education is needed. The emerging signs of digital development at the national level are encouraging, but until the central administration finds the resources (financial, human, authoritative) for a coherent program of reforms to develop the necessary infrastructure for a national e-government system ((and we do not „here does not mean only physical infrastructure, but also software, legislative and regulatory), cities will continue to create and implement digitization projects according to their priorities and resources, with all the advantages and disadvantages that this direction implies.

Thus, the purpose of this article is to deduce the specific regional and local policies aimed at achieving sustainable and smart urban development to show their need and necessity. That is why we set ourselves the task of understanding the nature of sustainable and smart cities, on the one hand and managing the transformation of cities and urban territory in favor of people. Another essential task is to show, on the other hand, the need to analyze and evaluate the policies applied to achieve territorial sustainability and a sustainable smart urban environment to achieve their improvement and actualization of the set goals and objectives. In this regard, the main idea of the authors is to propose a model for analyzing and evaluating the implementation of policies towards the development of sustainable and smart cities. The developed model is applied to urban centers in the northeast region of Bulgaria. The application of the evaluation model developed by the authors shows significant differences between the development of cities. In practice, Bulgarian cities in the studied region are at the beginning of their transformation towards sustainable and smart cities. The authors use geographic information systems as an important tool to analyze and illustrate the imbalances and achievements in the process of sustainable smart urban development.

Research Methodology

An important area related to the transition towards sustainable cities is the measurement of their resilience and smartness. In practice, the assessment of progress toward becoming sustainable cities focuses on the analysis of the effects of the implementation of good practices and policies for the sustainability of agglomerations and territories (Morano, Tajani, Guarini, Sica, 2021; Yigitcanlar, 2018). In this sense,

measuring sustainability is the effect of implemented policies on the urban environment. Sustainable city development policies reflect the improvement of the local ecosystem. This is done by making urban systems smart, which reduces the number of resources that are needed for the urban center.

The authors propose a sophisticated model for the assessment of public policy and practices in the field of sustainable city development. The results that the authors achieved are related to the effectiveness of sustainable city policy through the Bulgarian municipalities' progress in the transition to smartness and territorial sustainability. At the same time, Bulgaria's membership in the European Union requires us to comply with the guidelines and its policies in the direction of the practical implementation and development of intelligent technologies in the individual territories. The European Parliament (2014) offers a simple definition that includes different concepts: A smart city seeks to solve societal problems through technology-based solutions within a partnership between different actors, both public and private.

The proposed methodology is based on the opinion that territorial sustainability and smart city development are complex and integrative processes. They made social, economic, and ecological changes in the environment. In this sense, there is an objective need for the analysis and evaluation of sustainable city policy which requires the use of interdisciplinary and network approaches. The authors use comparative, statistical, and GIS analysis.

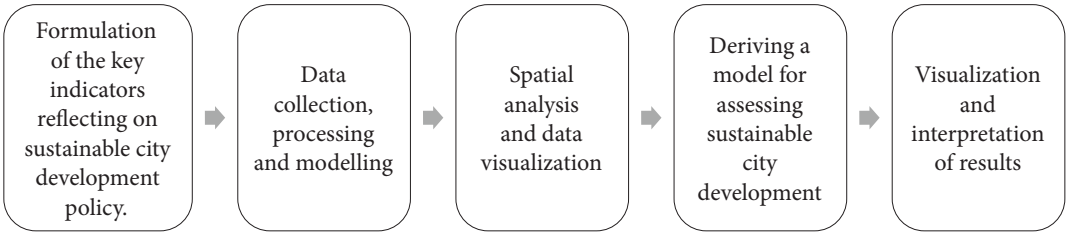

Figure 1. *Research framework.*
Source: Authors.

The study's main objective is to analyze and assess the smart and sustainable development of municipalities in the Northeast Planning Region through a developed model. The relevance of the research stems from the transition that cities are going through on the way to smartness and sustainability. There is a strong necessity for sophistication and upgrade of sustainable city policies evaluation, especially in the context of the Green Deal.

The important part of the research methodology is the formulation of indicators for the evaluation of sustainable city development. Based on the proposed system of indicators and criteria for the evaluation of municipalities, the authors calculate their weighted values, which express the generalized model for the evaluation of municipalities. The authors use the data for the period from 2015 to 2021. In the many definitions of smart cities, it is common to talk about the use of indicators to evaluate and analyze the level of intelligence of cities.

It is assumed that the conceptual framework of 'smart territory' emerges strongly not only as an extension of the smart city concept but also as its opposite. This suggests that hard work needs to be done to derive indicators that indicate the sustainable framework for achieving smart cities. Of course, this may require a numerical divide between and within geographical areas, especially in rural areas or villages. This calls for us to broaden the field of analysis and apply an interdisciplinary approach as well. On the other hand, however, the concepts of smart and sustainable development of territorial units have a common vision and share similar goals, This implies a boundary-spanning approach in defining common,

interrelated factors and criteria for the assessment, analysis, and measurement of smart sustainability. In this way, the evaluation indicators themselves can be defined more easily and have a consensual character. To achieve a common analysis and evaluation of a comprehensive system of indicators that measure, for example, the status or progress towards smart sustainability, we need to choose indicators that are close to both concepts. Such common evaluation indicators could be:

Internet infrastructure. It includes broadband network connectivity in the territory, the share of the population with access to the Internet;

- Adoption of the Internet of Things (IoT) concept - individuals/businesses/administration using Internet-connected devices and systems, and use of the Internet to interact with administrative bodies and public institutions.

Smart Governance. Includes e-government services directly linked to digital infrastructure:

- availability of digital delivery platforms, by local administration and citizen access to public services
- availability and accessibility of public data for public use and transparency of information;
- availability of platforms and mechanisms for citizen participation in decision-making processes.

Sustainable infrastructure. Includes engineering and technical infrastructure such as:

- Energy infrastructure - renewable energy installations, energy-efficient buildings, energy efficiency systems, and technologies;
- transport infrastructure - provision of different modes of transport to populations and settlements, quality of transport infrastructure, transport management systems (smart mobility);
- social infrastructure - provision of hospitals, healthcare facilities, and access to social services;
- waste management - the proportion of population and settlements covered by waste collection systems, waste collection, and treatment facilities, and intelligent waste management systems;
- water management - efficient use of water, water supply and sanitation systems, wastewater treatment plants.

Innovation and technology. Includes development of innovation, research, and development - investment in research, collaboration between academia and industry;

- the presence of innovation centers, technological enterprises, Start-up systems, the share of employees in these types of enterprises, and the digital skills of the population.

Environmental sustainability - includes activities related to environmental management and protection:

- Air pollution - levels of harmful emissions and greenhouse gases, promotion and investment in renewable energy sources, reduction of fuel use;
- biodiversity conservation - protected areas, biodiversity conservation investments, habitat restoration, and sustainable land use practices;
- waste management - measures to improve waste and wastewater management, reduce the amount of waste generated by households and industry, involve citizens in waste management, and separate waste collection.

Social and cultural sustainability - related to social justice, well-being, and quality of life of citizens:

- Access to services - health, education, justice, transport, and mobility. Social justice - material and social deprivation, populations at risk of poverty and social exclusion;
- Preservation of cultural and historical heritage - measures and investments to preserve cultural diversity, support local cultural practices, and maintain heritage sites.

Economic development - includes indicators to measure the economic progress of the territory:

- assessment of the overall economic performance and growth of the territory - GDP growth, GVA, the

economic activity of the population, number of enterprises, amount of investment in different sectors of the economy;

- socio-economic development indicators - employment and household income, labor migration.

The measures thus considered can be presented as follows:

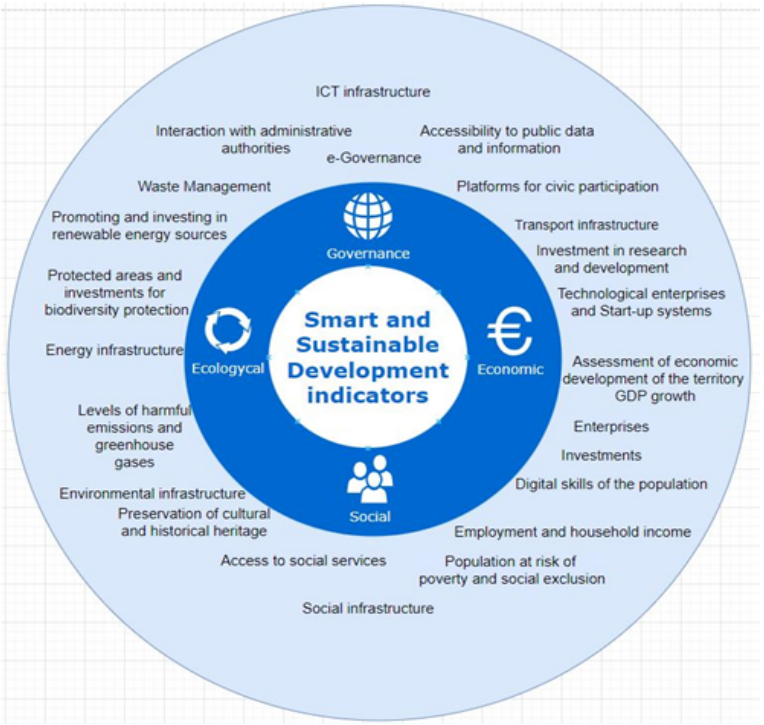

Figure 2. *Measurement directions.*

Source: Authors.

Each of the indicators is relevant to all elements of sustainable development and they cannot be categorically grouped by the respective dimensions of sustainable development. A change in the values of one indicator has an impact on the values of another indicator.

This system of indicators and benchmarks provides a generalized framework for assessing the smart and sustainable development of municipalities. Using these indicators, the progress of territorial units can be assessed, areas for improvement can be identified and efforts can be directed towards achieving a smarter and more sustainable urban environment.

Analysis of the theoretical framework in the field of sustainable and smart cities

The population is growing globally. This process is strengthened by the tendency of rapid expansion of cities. The excessive concentration of population in urban agglomerations creates several problems. These are related to the limitation of living space, the deterioration of the quality of the urban environment, and living conditions. At the same time, these processes are complemented by a reduction in the resources that urban centers need. The ongoing trends that are described are taking place in a changed digital environ-

ment, economy, land, and resource use reduction. In megacities and other urban centers, therefore, two concepts are intertwined - sustainable and smart development. Therefore, we can conclude that modern cities are distinguished by two main characteristics - sustainability (Trindade, Hinnig, da Costa, Marques, Bastos, Yigitcanlar, 2017; Quijano, Hernández, Nouaille, Virtanen, Sánchez-Sarachu, Pardo-Bosch, Knieilng, 2021) and smartness (Cai, Kassens-Noor, Zhao, Colbry, 2023; Gracias, Parnell, Specking, Pohl, Buchanan, 2023; Komninos, 2013; Komninos, 2011).

These two conceptual understandings argue for the development of sustainable cities (Egger, 2006; Cohen, Guo, 2021). In the scientific literature, we can find different definitions of sustainable cities such as "zero-carbon city", "ubiquitous eco-city" („U-eco-city"), and free eco-city (Hassan, Lee, 2015). Some authors explore the difference between a smart and sustainable city (Ahvenniemi, Huovila, Pinto-Seppä, Airaksinen, 2017). This analysis presents the definitions of the two terms. In most of the definitions, the authors apply a three-dimensional evaluation system - social, economic, and environmental dimensions. Of course, the governance of urban systems is paramount to achieving sustainability. Effective urban management affects the resources used (reduction of resources used). Efficient urban management mainly concerns water supply systems, electricity distribution, municipal waste, environmental construction, and urban transport. Achieving efficiency of systems is linked to their transition to smartness.

In practice, sustainable urban development precedes the smart city concept. Sustainable development as a view is not new, but in the last decade it has begun to establish itself as a conceptual understanding of urban development (Baker, 2015; Parris, Kates, 2003). An analysis of the literature reveals a plethora of studies aimed at uncovering key characteristics of sustainable and smart cities (Bibri, Krogstie, 2017; Bibri, 2018; Zhao, 2011; Evans, Karvonen, Luque-Ayala, Martin, McCormick, Raven, Palgan, 2019; Konbr, 2019). Some of the research is aimed at enriching the theoretical framework of sustainable cities (Laconte, 2018; D'Auria, Tregua, Vallejo-Martos, 2018; Höjer, Wangel, 2015; Janik, Ryszko, Szafraniec, 2020).

There are more than 43 definitions of a smart city. They are related to different areas such as ICT, e-government, e-services, etc. In recent years, the two concepts have been merged into the concept of a sustainable city.

The review of the academic literature shows that two main characteristics of smart sustainable cities can be identified - sustainability and smartness. To achieve the construction of a sustainable smart city the foundation must be laid. It is related to territorial governance and achieving territorial sustainability and smart development. Some studies can be found in this direction (Battisti, Campo, Manganelli, 2022; García-Madurga, Grilló-Méndez, Esteban-Navarro, 2020; Troisi, Ciasullo, Carrubbo, Sarno, Grimaldi, 2019; Mitrică, Dumitraşcu, Mocanu, Grigorescu, Şerban, 2021).

An important strand of the academic literature in this area covers the analysis and evaluation of various authors on territorial sustainability and progress in building smart sustainable cities. According to the authors, resilience is a key objective in developing strategies to transform cities into smart and sustainable (Quijano, Hernández, Nouaille, Virtanen, Sánchez-Sarachu, Pardo-Bosch, Knieilng, 2022). These plans aim to manage territorial sustainability, which includes achieving resource efficiency, resilience, and smart cities. Therefore, according to the authors, the definition of indicators and the evaluation of procedures are very important.

In fact, according to the authors, making a city sustainable and smart increases its attractiveness. This concept is also adopted by other authors who believe that such a city should provide better services in transport, health, and education. The authors are aware of the importance of building a system (framework) of indicators for grading the performance and sustainability of smart cities (Petrova-Antonova, Ilieva, 2018). Similarly, Garam and Pavan's attempt to assess the quality of cities through the use of indicators and other methods for the evaluation of smart and sustainable cities is in line with their views. (Garau, Pavan, 2018). They apply their methodology to the city of Cagliari, Italy. Some indicators are related to the development of smart city strategies, high quality of life, sustainable economic development, and others. Key indicators are environment, mobility, people, economy, governance, and technology. Growth is based on better infrastructure, healthcare, smart communication, social infrastructure, and security.

Other authors share similar views that benchmarking should be applied based on standardized indicators for smart sustainable cities. (Huovila, Bosch, Airaksinen, 2019). The authors define a system of 413 indicators that are based on standards of indicators for 7 different cities.

Other studies focus more on the performance and performance of sustainable smart cities. One of them focuses researchers‘ attention on empirical benchmarking by developing and applying optimization patterns in China (Li, Fong, Dai, Li, 2019).

The other research focuses on an overview of the trends, architectural patterns, components, and challenges of building smart sustainable cities (Silva, Khan, Han, 2018).

Analyses related to smart city governance are also available. The research focuses on the choice of an approach to assess community participation in policymaking (Castelnovo, Misuraca, Savoldelli, 2016).

Research can also be found that explores the assessment and opinion of the local community regarding the development of smart sustainable cities (Macke, Sarate, de Atayde Moschen, 2019). All analyses cover different aspects of smart and sustainable cities. An important part of them includes the analysis and assessment of the pace of development and the achievement of goals related to the sustainability and smartness of urban systems.

Results of the municipalities' comparative analysis and evaluation

The analysis of the municipalities of the North-Eastern Planning Region in Bulgaria aims to present the current state of smart and sustainable development of the municipalities. The analysis includes some of the key indicators and benchmarks for smartness and sustainability. The focus is on the four urban centers - municipalities with a population of over 40,000 people - which have a role as growth drivers in North East Bulgaria.

As can be seen from the Figure 3, the distribution of the population across the country is uneven, concentrated in the main urban centers in Bulgaria. These urban centers have emerged as economic growth centers and are characterized by higher levels of GDP per capita.

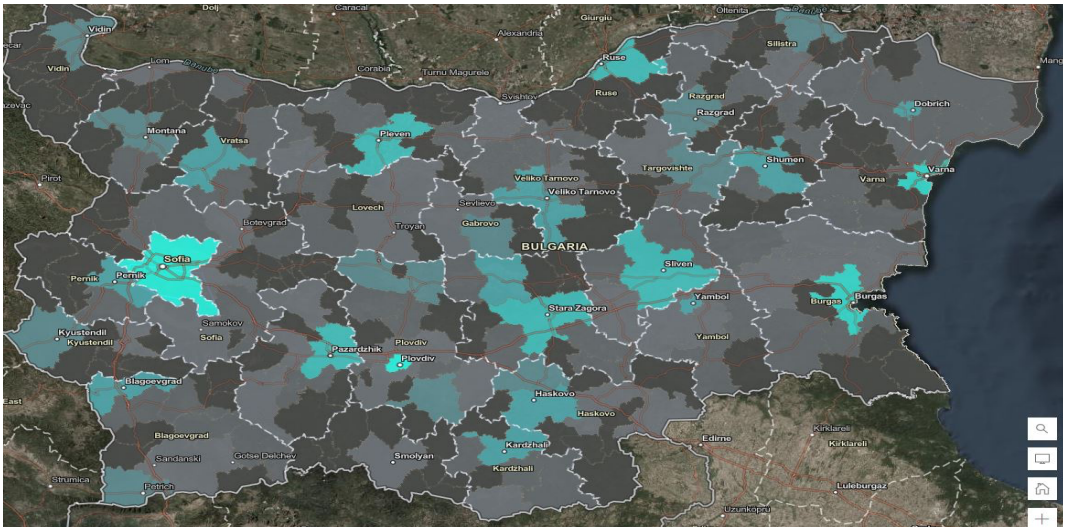

Figure 3. *Population distribution by municipality and GDP per capita levels by 2022.*
Source: Authors.

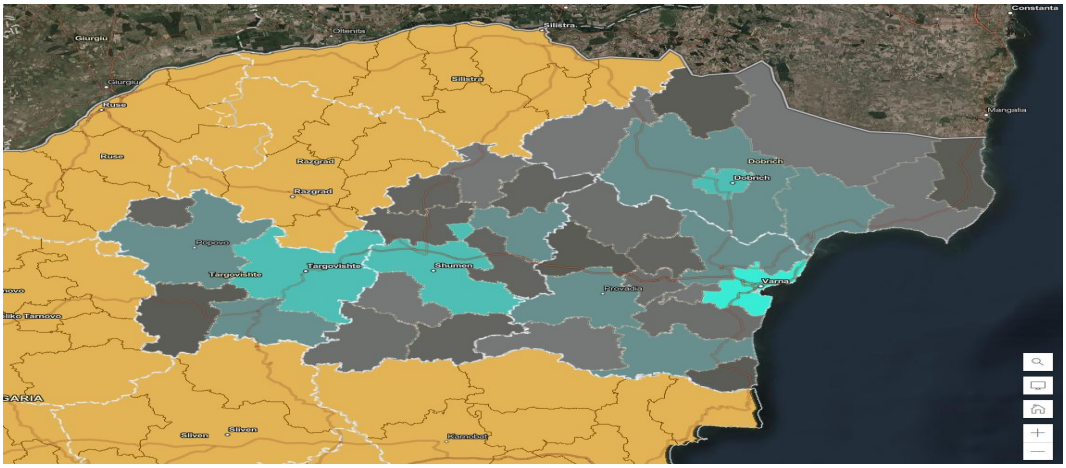

Figure 4. *Population distribution by the municipality and GDP levels for the Northeast planning region in Bulgaria by 2022.*

Source: Authors.

For the Northeast planning region such economic centers are the municipalities of Varna, Dobrich, Shumen, and Targovishte. The population of the region as of 31.12.2022 is 823 884 people, which is 13% of the population of the country. The population of the region is mainly concentrated in the four municipalities, with Varna municipality accounting for 39% of the region's population, Dobrich, and Shumen municipalities with about 9% each, and Targovishte municipality with 6% of the region's population (Figure 4).

The region's GDP for 2022 is BGN 13 892 million, which is 10% of the country's total GDP. The largest economic center Varna produces about 60% of the region's GDP, followed by Dobrich with 15%, Shumen with 15%, and Targovishte with 10% of the region's total GDP. The region's GDP per capita is BGN 15,135, which is significantly behind the national average (BGN 24,247) and the EU average (BGN 68,987, according to Eurostat).

The application of ICTs and the population's ability to access and use these technologies are most important for progress toward the smart and sustainable development of cities and municipalities. ICTs are relevant to citizens' access to information, citizen-local government interaction, business-local government, citizen participation in urban planning processes, infrastructure, waste, and environmental management, etc. For the application and use of ICTs in urban settings to be effective, certain factors that have a direct impact on progress toward smartness and sustainability need to be considered:

Firstly, the provision of territory and the population's access to digital infrastructure.

In recent years there has been an increase in the proportion of the population with access to the Internet. The proportion of households with internet access in the Northeast region for 2022 is 85.4%, which is close to the national average of 87.3%, with a trend towards the EU average of 92.4% (Figure 5).

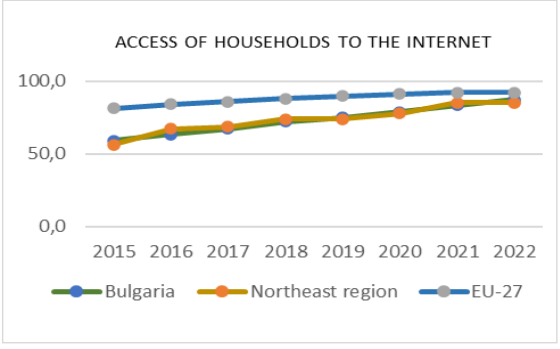

Figure 5. *Household internet access 2015-2022.*

Source: Authors.

Naturally, urban centers are better provided with 88.8% internet access and 82.4% provision in rural areas. The share of enterprises with Internet access is similar, just over 90%.

Next, the interaction of citizens/businesses with public institutions and access to public e-services.

For the period 2015-2021, there is an increase in the share of people using the Internet to interact with public institutions, reaching 26.6% in 2021. This interaction mainly consists of obtaining information from a public institution's website or app 19.1%; submitting documents, forms, declarations, or reports online 15.5% (Figure 6).

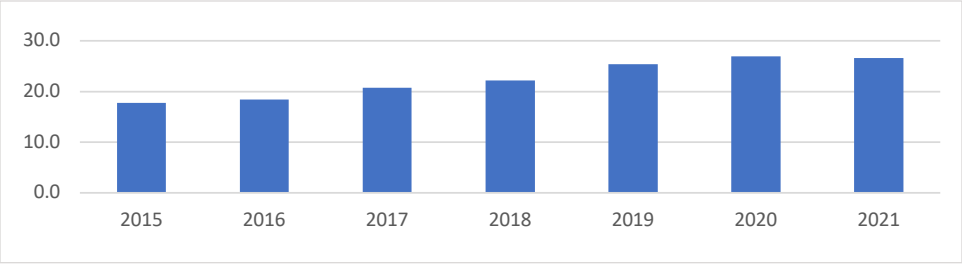

Figure 6. *People use the Internet to interact with public institutions.*

Source: Authors.

The age and educational structure of the population is the next most important factor in the use of ICT.

As seen in the figure, people with higher education use the Internet more and more often. Most of the younger population also uses the Internet more often, with over 90% of the 16-44 age group. As the age of the population increases, the percentage using the Internet regularly decreases. The employment status of the population also has an impact, with the employed using the Internet significantly more than the unemployed. The highest proportion of students is 98.9% (Figure 7).

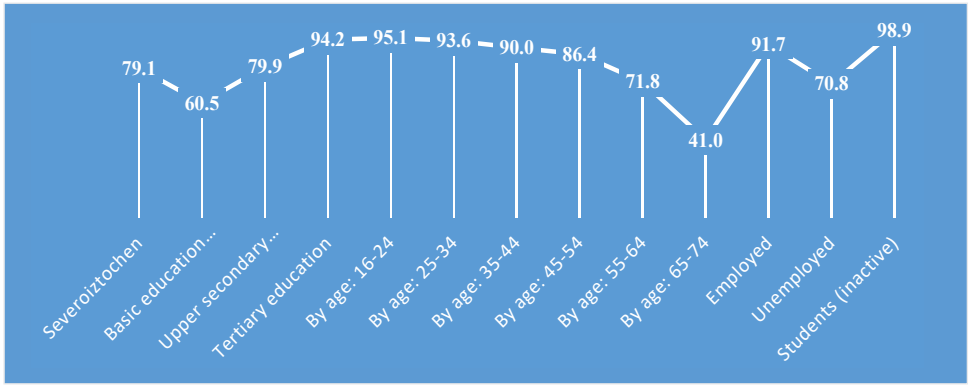

Figure 7. *Persons using the Internet regularly (every day or at least once a week), 2021.*

Source: Authors.

The level of education has a bearing on the use of the Internet to interact with public institutions, with the proportion of those with higher education at 55%, with secondary education at 22.8%, and with primary education or less at 5.1%.

In summary, it can be said that in recent years the internet connection and internet usage of the population has tended to increase and reach the European average. Increasing education and employment (income) of the population has an impact on the use of the Internet and the purpose of its use. At the same time, the penetration of new technologies is changing the vision of industrialization and increasing innovation. In addition, the drive to make cities inclusive and safe. This can also be done by using the components of the Digital Economy and Society Penetration Index. In practice, the Digital Economy and Society Index (DESI) monitors Europe's overall digital performance and tracks the progress of EU countries in terms of their digital competitiveness. It monitors Member States' performance on digital connectivity, digital skills, online activity, and digital public services on an annual basis to assess the state of digitization in each Member State and to identify areas requiring priority investment and action.

The data on the current situation of the municipalities under consideration in the North-East planning area, related to the indicators derived for the assessment of smart and sustainable development, are presented in the attribute table of the GIS system. The figure presents visualized data on the key indicators of the current state of the municipality.

Varna Municipality, the main economic center, is characterized by significantly higher levels of socio-economic and technological development than the other municipalities in the region. As of 2021, the population of the municipality is 341,737 people, with the share of the working-age population being 62.8%. The age dependency ratio of the population is 62.8%, that is, 37.2% of the population is below and above working age, with 22.6% of the population aged 65 and above (Figure 8).

The educational structure of the population shows that the highest share of persons aged 25-64 years with completed secondary education is 50%, with primary or lower education - 7.5% and completed higher education 42.5%.

In terms of access to the Internet, Varna Municipality has indicators above the national and EU average - 99.4% of the population has access to the Internet. Nearly 90% of people aged between 16 and 74 in the municipality use the Internet every day or at least once a week (Figure 8).

Varna Municipality has an environment for providing electronic administrative services. For example, the water supply and sanitation sector allows for full digitization. Compared to other large urban centers, a wider range of administrative e-services is offered - more than 100 e-services for the population and busi-

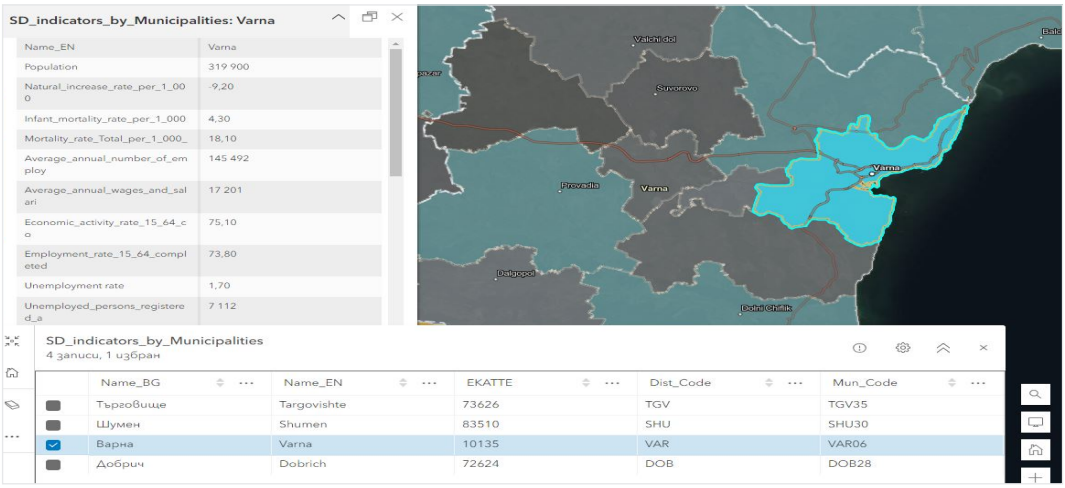

Figure 8. *Visualization of Varna Municipality Key Indicators.*

Source: Varna Municipality.

ness, in the following areas: Human Resources Management, Information and Administrative Services, Ecology and Environmental Protection, Municipal Property, Economy and Business Activities, Tourism, Architecture, Urban Planning and Planning, Engineering Infrastructure and Public Works, Local Taxes, Security Management and Public Order Control, Healthcare (Varna Municipality, 2023).

In the North-Eastern Planning Region of Bulgaria, after Varna Municipality, Dobrich Municipality ranks in terms of socio-economic and technological development.

As of 2021, the population of the municipality is 80,936 people, with a 64% share of the working-age population. There is an aging population, with nearly 22% of the population over 65. The economically active population is 68%, while the unemployment rate is 3.5%.

The educational structure of the population shows that the largest share of persons aged 25-64 years completed secondary education - 56%, with primary or lower education - 17% and completed higher education 27%.

The relative share of the population with Internet access is 97%, and the level of digital skills is relatively low. The relative share of people aged 16-74 using the Internet regularly is approximately 90%.

Based on the information provided by the Municipal Information Portal of Dobrich (Dobrich Municipality, 2023), the municipality is connected to a unified model for requesting, paying for, and providing electronic administrative services with 69 electronic forms for electronic administrative services developed and published in the following areas (Figure 9).

The other urban center, Shumen Municipality, is characterized by significantly lower-than-average levels of socioeconomic and technological development.

As of 2021, the population of the municipality is 72,997 people, with a working-age population of 65.75%. The proportion of unemployed is significantly high at 4.2%, while the economically active population is 67.7%. About 20% of the population is over 65 years of age.

The educational structure of the population is like that of Dobrich, with the share of persons aged 25-64 with completed secondary education being 56.6%, with primary or lower education - 16.4% and completed higher education 27% (Figure 9).

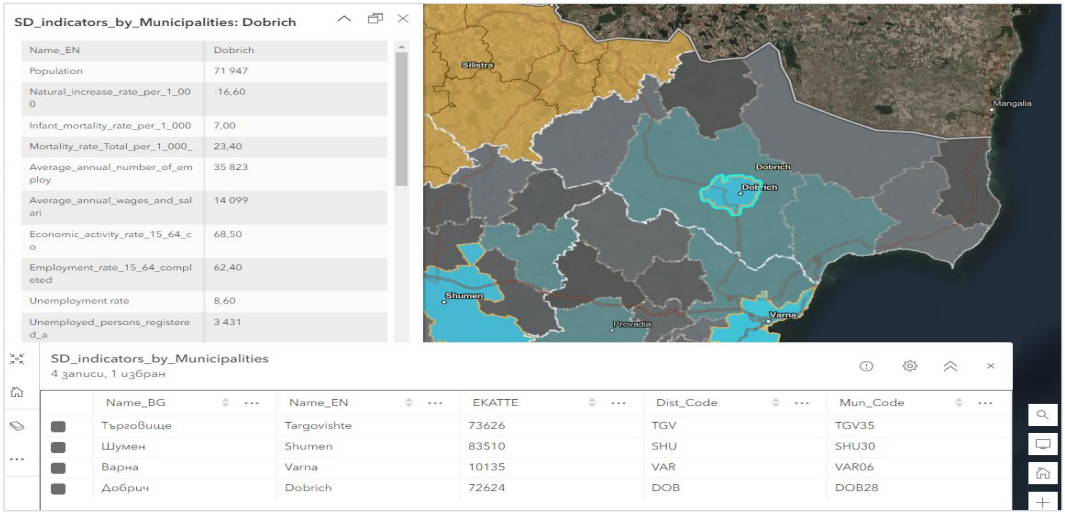

Figure 9. *Key measures of Dobrich Municipality.*

Source: Dobrich Municipality.

The relative share of the population with Internet access is 96.4%, and the level of digital skills is also relatively low. The relative share of people aged between 16 and 74 using the Internet regularly is around 85%. Shumen Municipality provides 34 e-services (Shumen Municipality, 2023) (Figure 10).

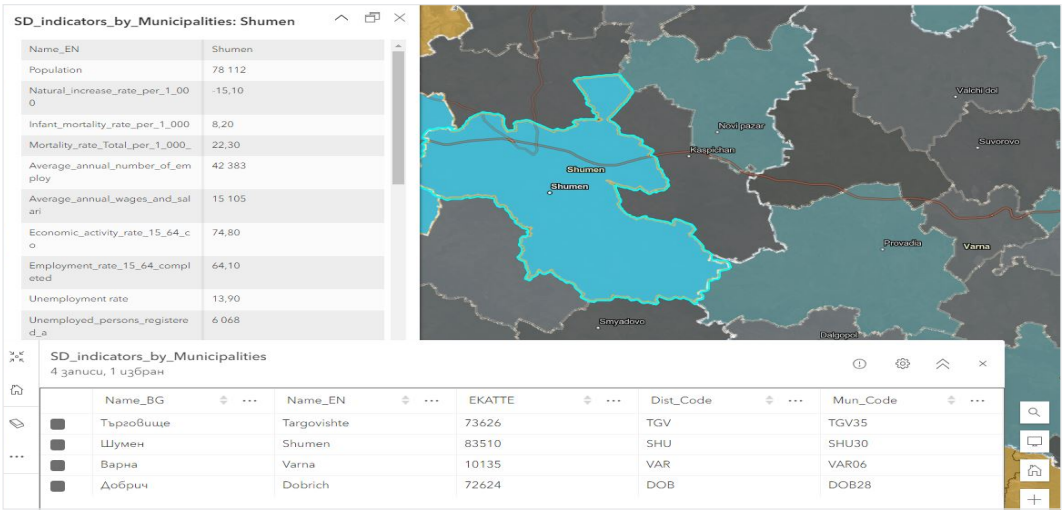

Figure 10. *Key measures of Shumen Municipality.*

Source: Shumen Municipality.

With the lowest levels of socioeconomic and technological development in the Northeast planning region is the administrative center of Targovishte.

The levels of development of the municipality are significantly lower than the national average. The population of the municipality is 53,041 in 2021. The economic activity rate of the population aged 15-64 is 62.4%, while the unemployment rate exceeds 10%.

The relative share of the population aged between 25 and 64 with secondary education is 50.6%, with primary and lower education 32.2% and with higher education 17.1%.

The relative share of the population with access to the Internet is about 97%, and the level of digital skills of the population is significantly low. The relative share of people aged 16-74 using the Internet regularly is about 80%.

The Municipality of Targovishte provides a significant number of electronic administrative services - over 100, in the following groups (Targovishte Municipality, 2023) (Figure 11).

It is noteworthy that the e-services portals of the municipalities of Varna, Shumen, and Targovishte work only in Bulgarian.

The provision of Internet and e-services in the examined municipalities of the Northeast planning region is relatively good and exceeds the EU average of 19 e-services by a significant margin. The more remote and sparsely populated places in the municipalities mentioned are characterized by certain communication difficulties, both socially and economically, which isolates them from the social and cultural life of the country. In this regard, the public authorities should create conditions for the inclusion of information and communication technologies in people's lives and the implementation of Smart city initiatives. This corresponds with the ongoing process of providing access to online services for people living in slums and remote areas, aiming to overcome these trends and promote social cohesion.

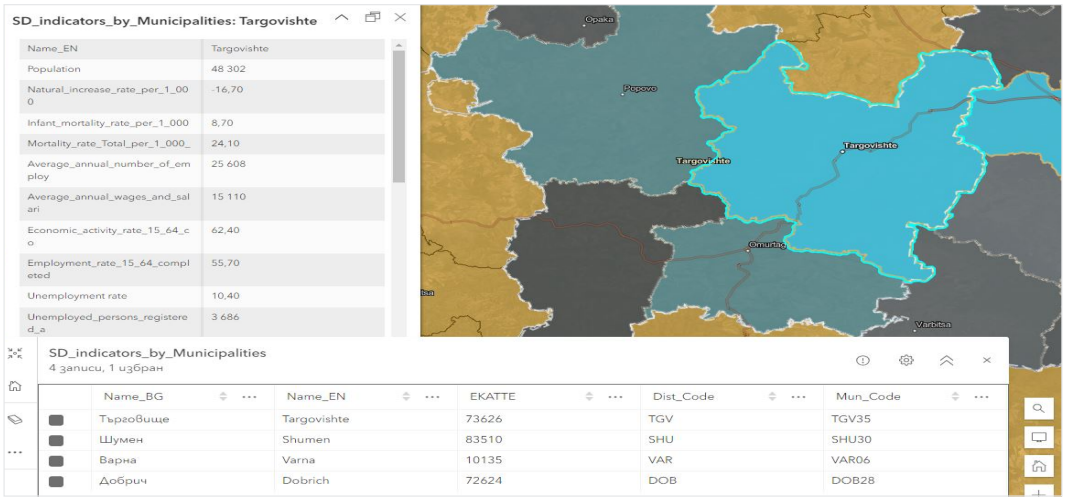

Figure 11. *Key measures of Targovishte Municipality.*

Source: Targovishte Municipality.

Conclusions

In conclusion, we can note that Bulgarian regions are trying to adapt quickly to European requirements for smart development. The main drawback remains previous shortcomings, concerning the foundation of the level of public works and the camouflage of the built infrastructure. Certainly, it can be inferred that the main urban centres in the Northeast planning region in Bulgaria are making progress in terms of smart and sustainable development. The municipalities of Dobrich, Shumen, and Targovishte could make more progress, as could the other cities in Level 3 and Level 4. The overall assessment shows that on smart development indicators - application of ICT, digital infrastructure, internet access, e-services provided by municipalities, etc., decent progress is reported, but it needs to be linked to integrated territorial investments and parallel measures related to regional development policies. This is evident due to the abandonment of other indicators related to sustainable development, especially in the areas of social, economic, demographic, political, and environmental activities, it is evident that the progress of municipalities is small, below 0.5, with only the municipality of Varna with 0.73. This is the main reason for the low values of the index for achieving smart and sustainable development. This requires significant action by local and national authorities to achieve sustainability. However, opportunities should be sought to improve all the development indicators of these municipalities. The backbone of this opportunity should focus on the regional centres of Varna, Dobrich, Shumen, and Targovishte, which will build the foundation of the regional network between them. In this direction, a possible direction of improving the system of awareness and connectivity by stimulating medium and long-term development of the regulatory framework that can create the legal context necessary for digital development. Involvement of relevant participants in the field of the information society (citizens, companies, local and central authorities, educational institutions, and others). Achieving interoperability, service integration, and openness of data sets and application source code between Varna, Dobrich, Shumen, and Targovishte. Building, developing, and strengthening supercomputing resources and data processing capabilities. Increasing the availability and expanding the use of supercomputers in areas of public interest such as health, environment, security, industry, and entrepreneurship (especially small and medium-sized companies). Increasing security by developing a secure communication infrastructure - Quantum Communication Infrastructure. The use of common security tools and procedures at the level of the European economy.

Another important problem is the retention of the young population in the regions. We have witnessed two types of migration. The first consists of the national space towards the capital city of Sofia or the cities of Plovdiv and Varna as new regional economic centres characterized by a higher level of geo-economic development. This result shows that within the regions, the philosophy for the development of the municipalities must be changed. There is a need to impose the integrated management model, which means creating new opportunities for attracting investments and promoting business initiatives of the population supported by the funds and the state in all municipalities in the specified regions. It is necessary to improve the level of improvement and develop the local potential of the population by applying soft measures for regional development, as well as looking for joint initiatives and projects with dynamically developing municipalities and regions to share capacity and experience. The use of the twinning tool between cities and towns from the European space is one of the possibilities for promoting European integration. Another approach could be the preparation of inter-municipal projects and policies that have a general significance for regional development. In practice, through the implementation of a successful territorial development model, it will be possible to achieve an increase in people's well-being, and from there to find a regional development model that reflects the specifics of the region. In addition, this model can serve to evaluate the accumulated experience by showing the possibility of real intelligent and sustainable development of municipalities.

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MODELIS, SKIRTAS TVARIŲ BULGARIJOS MIESTŲ ANALIZEI IR VERTINIMUI VIETOS VIEŠOSIOS POLITIKOS PRITAIKYMO KONTEKSTE

Anotacija. *Pastaraisiais metais dėl ekonomikos skaitmeninimo ir didėjančios išteklių paklausos besivystančioms šalims, jų regionams ir miestų aglomeracijoms kilo nemažai iššūkių. Todėl daugelis vyriausybių ėmėsi reikšmingų pokyčių besivystantiems regionams ir miestams taikomoje politikoje. Šiomis naujomis koncepcijomis siekiama palaipsniui kurti tvarius ir išmaniuosius miestus. Taip šalys reaguoja į naujus iššūkius, tokius kaip skaitmeninė aplinka, kova su klimato kaita ir palankių gyvenimo sąlygų palaikymas dėl didelio aplinkos ir socialinio bei ekonominio degradavimo. Atsižvelgdami į tai, autoriai išsikėlė pagrindinį tyrimo tikslą - analizuoti ir vertinti miestų ir juos supančios teritorijos tvarumą įgyvendinant darnaus vystymosi politiką visais lygmenimis. Pagrindinis autorių uždavinys ir sunkumas - sukurti ir patobulinti modelį, kuris galėtų būti naudojamas tvariems ir išmaniesiems miestams vertinti. Šiame straipsnyje autoriai siūlo darnių miestų tyrimo metodą, taip įvertindami šioje srityje įgyvendinamos politikos poveikį. Modelis apima pagrindines rodiklių grupes, kurios naudojamos Bulgarijos šiaurės rytų regiono savivaldybių darniam ir išmaniajam vystymuisi analizuoti. Remiantis šiais rodikliais, renkami ir apdorojami duomenys, atliekama lyginamoji ir statistinė analizė, siekiant įvertinti jų tvarumą ir sumanumą. Autoriai daro svarbias išvadas. Pavyzdžiui, kad darnaus ir sumanaus vystymosi lygis nepatenkinamas, nors aplinka ir sąlygos nacionaliniu lygmeniu yra palankios. Iš tikrųjų Bulgarijoje, remiantis tirtų Šiaurės rytų regiono savivaldybių vertinimu, akivaizdu, kad negalima kalbėti apie tvarius miestus, nes Bulgarijos savivaldybės vis dar yra šio vystymosi kelio pradžioje.*

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