

**Improving the level of
suburban development
through the application of 5G
technologies and their
implications for regional
governance**

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INTRODUCTION

Regional development is of significant importance in the context of regional development. In this direction, the advent of the fifth generation (5G) mobile network represents the evolution of previous generations, namely 2G, 3G, and 4G, and the advent of a new era in mobile communications. The implementation of 5G also presents new opportunities for regional development.

INTRODUCTION

The convergence of regional development, public works, and 5G technology presents an opportunity to incorporate a range of advanced features that will position it as the dominant technology of the future. This paper identifies the potential uses, challenges, current and future research ideas, threats, and security features of 5G mobile networks in public works and more effective regional development management

INTRODUCTION

It is anticipated that the applications of 5G technology will facilitate the implementation of novel ideas and creative solutions to enhance garbage collection processes, gas supply, intelligent transportation, and other large-scale operations in a range of critical infrastructures, including energy, food, finance, and healthcare.

Furthermore, it is expected that 5G will be employed in defense, public order, and regional security

METHODOLOGY

The study aims to analyze the progress and opportunities for the development of the 5G network, thus illustrating the role of new technologies in the regional development of the Bulgarian state. The criteria and indicators that the authors believe need to be analyzed and evaluated to meet the objective thus formulated are 5G network coverage; free access to the Internet and 5G technology; quality of services related to 5G; competitive environment and communication services; speed; and overall 5G network performance.

RESEARCH THEORY FRAMEWORK

In scientific literature, 5G is being explored in different directions - technical, economic, managerial, organizational, and others. In the present study, the authors focus their research on the analysis of the development of the new technology and its role in the regional development and management of the Bulgarian regions.

RESEARCH THEORY FRAMEWORK

Massive IoT networks will be used in the energy sector (Internet of Things - IoT involves the interconnection of various devices equipped with network technology that can be used in applications to automate various activities).

Within this sector, 5G will connect a large number of 2 embedded sensors, thus significantly reducing data transmission and monitoring times through new protocols with lower power consumption

RESEARCH THEORY FRAMEWORK

5G will transform the transportation sector, with two distinct forms of communication emerging: vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I). The cloud is a technology that integrates information systems, applications, and databases accessible from anywhere via the Internet.

In the food sector, consumers increasingly feel the need for greater transparency about the food products they consume

In healthcare, the benefits of 5G will vary depending on the main players in the field, namely medical professionals, patients, and pharmaceutical companies.

In the financial sector, 5G technology will enhance mobile applications and remote banking services

RESULTS AND DISCUSSION

81% of the EU population use 5G networks. The EU lags behind the US, where coverage is 96%. Bulgaria exhibits a coverage rate below the EU average, with 67.2% of the population covered. It is to be expected that the countries with the highest levels of 5G coverage are smaller countries such as Cyprus and Malta, which have achieved 100% coverage.

The three major mobile operators, providing internet and mobile services in Bulgaria are A1, Vivacom, and Yettel. The three mobile service operators are responsible for 5G network construction.

RESULTS AND DISCUSSION

The data indicates that the number of 5G base stations in the country is in progress. Until September 2023, the number of 5G base stations in the country was 3,697 [18]. Of these, 2,808 are within the 3.4 3.8 GHz frequency range. Additionally, 884 base stations, using DSS technology are within the 4G spectrum.

Fig. 1. Internet coverage of A1 operator in Bulgaria



RESULTS AND DISCUSSION

Internet coverage of Vivacom operator in Bulgaria



RESULTS AND DISCUSSION

Fig. 3. Internet coverage of Yettel operator in Bulgaria



RESULTS AND DISCUSSION

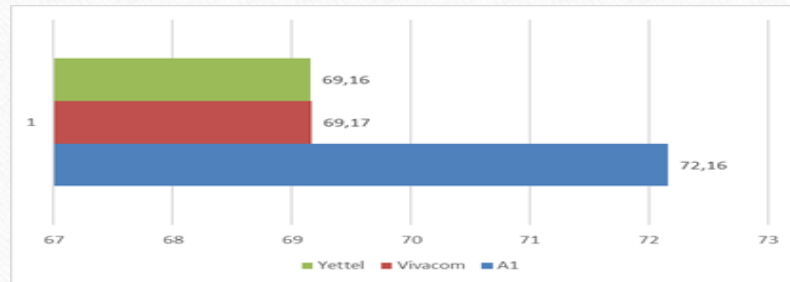


Fig. 4. Browsing Performance rate (average) of mobile operators in percentage for 2023 in Bulgaria

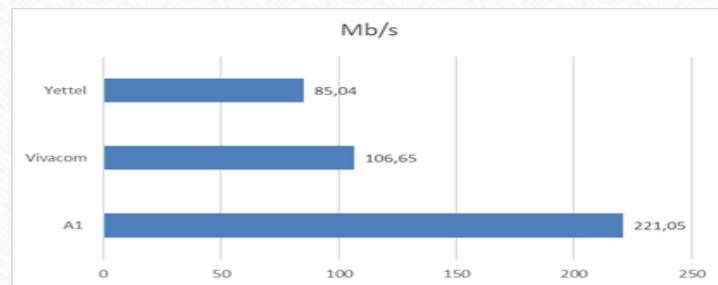


Fig. 5 Download speed average in Bulgaria by mobile operators

RESULTS AND DISCUSSION

As is shown in the theoretical framework 5G network prerequisites for economic and regional development. The infrastructure improvement can explain this thesis. 5G network forms a specific environment allowing IoT exploitation in the public, private sector, and households.

However, the above conclusions do not apply to urban and rural development which we see in the table after

HOUSEHOLD INTERNET BY STATISTICAL REGIONS IN BULGARIA.
SOURCE: NATIONAL STATISTICAL INSTITUTE.

	2018	2019	2020	2021	2022	2023
Cities	76,3	79,7	83,8	87,4	88,8	91,8
Villages	59,0	60,0	63,4	71,5	82,4	77,0

RESULTS AND DISCUSSION

We consider a strong connection between rural, Internet, 5G development, depopulation, infrastructure quality, and accessibility level [23]. This means that rural areas are at risk of marginalization that can be overcome with technological innovations. On the other hand, technological innovations are limited by Internet access and 5G network development creates opportunities for rural areas development in Bulgaria.

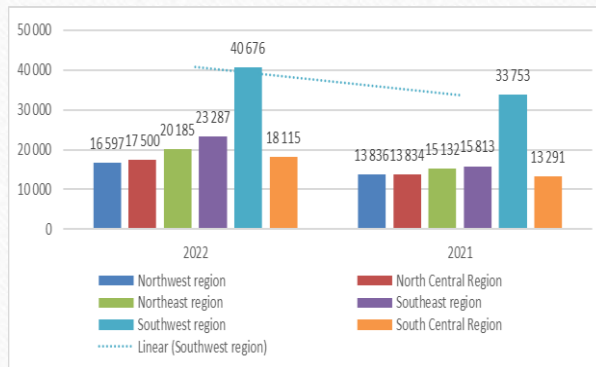


Fig. 6. GDP per capita by regions in Bulgaria. Source: NSI.

HOUSEHOLD INTERNET BY STATISTICAL REGIONS IN BULGARIA.
SOURCE: NATIONAL STATISTICAL INSTITUTE.

Region/year	2018	2019	2020	2021	2022	2023
Northwest	62,0	70,8	66,2	73,5	83,1	82,6
Southcentral	68,5	73,2	74,8	82,7	85,6	85,4
Northeast	73,9	74,0	77,7	85,2	85,4	86,5
Southeast	70,0	74,7	77,7	81,7	84,9	87,5
Southwest	75,3	77,8	77,7	86,2	90,5	92,8
Southcentral	73,7	75,3	77,7	85,5	88,6	87,8

CONCLUSION

5G technologies are a cornerstone for Bulgaria's development. The authors find a strong link between 5G network development, regional development, and governance. Improvements in regional governance can be found in energy, finance, medicine, transport, and other sectors.

The research results show significant progress in 5G network development in recent years but in highly urbanized areas. This process puts smart rural development at risk. This is because agriculture is a key sector in these areas, which needs to be digitized based on 5G and IoT technologies to be more efficient.