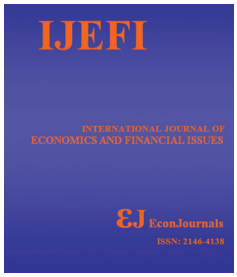

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Resilience of the Bucharest Nine Countries in the Context of Global Turbulence

Larysa Lebedeva[1]*, Diana Shkuropadska[1], Jorge Gonçalves[2], Iryna Shtunder[1], Tatyana Ozhelevskaya[1], Yuliya Yasko[1]

[1]Faculty of Economics, Management and Psychology, Department of Economics and Competition Policy, State University of Trade and Economics, Ukraine, [2]Instituto Superior Técnico, Department of Civil Engineering, Architecture and Environment, University of Lisbon, Portugal. *Emai: l.lebedeva@knute.edu.ua

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ABSTRACT

Ensuring the resilience of the Bucharest Nine (B9) countries is crucial for regional and Euro-Atlantic security, with the challenges such as Russia's aggression against Ukraine, hybrid warfare threats, regional tensions, etc. The goal of this research is to assess the resilience levels of the B9 countries and to identify aspects of their vulnerabilities and capacities to withstand global turbulence. This study analyses the Resilience Dashboards by the European Commission. The findings indicate that most B9 countries have a medium level of vulnerability, aligning with the EU27 average, while their capacity levels remain below the EU27 average. The analysis highlights that B9 countries demonstrate medium socio-economic resilience, with improvements in employment but persistent challenges in health and education with Czechia being the most resilient in this category. In green resilience, Estonia, Czechia, and Poland perform best, though still below the EU27 average, while Bulgaria and Romania face significant environmental challenges. Digital resilience shows notable positive shifts, with improvements in cybersecurity and digital skills, but challenges persist in broadband access and online public services. Estonia leads in digital resilience, while Bulgaria and Romania lag. Geopolitical resilience is at medium level. Hungary, Estonia, Lithuania, and Latvia have the highest geopolitical capacities, whereas Romania remains the most vulnerable.

Keywords: Resilience, Bucharest Nine (B9) Countries, Economic Resilience, Social Resilience, Environmental Resilience, Digital Resilience, Geopolitical Resilience
JEL Classifications: H12, L78, O52

1. INTRODUCTION

Ensuring the resilience of the Bucharest Nine (B9) countries amid global turbulence is a strategic task for regional and Euro-Atlantic security. The Bucharest Nine consists of nine Central and Eastern European countries that are NATO members: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia. This initiative was established in 2015 to coordinate defense and security efforts, particularly in response to increasing threats from Russia.

The key challenges of global turbulence for the B9 countries include: Russia's military aggression against Ukraine; hybrid warfare threats, including cyberattacks and disinformation; rising tensions in the Black Sea and Baltic regions; the need to diversify energy resources due to dependence on Russian energy supplies; the necessity to adapt to climate change and ensure energy resilience.

The B9 countries form an important buffer between Russia and other NATO members. Their resilience impacts not only regional

security but also the stability of Europe as a whole. Enhancing their economic, social, environmental, digital, and geopolitical resilience is a priority for both the countries themselves and their NATO and EU partners.

The goal of this research is to is to assess the resilience levels of the B9 countries and to identify aspects of their vulnerabilities and capacities to withstand global turbulence.

2. LITERATURE REVIEW

Implementing a resilient national framework is a complex yet necessary endeavor, offering significant advantages while also presenting notable challenges. A robust resilience framework can enhance disaster preparedness, strengthen economies, improve governance, and foster social inclusion. However, financial constraints, institutional fragility, cultural barriers, technological limitations, and political instability often hinder its successful implementation. This discussion on the existing literature synthesizes insights from academic research, exploring both the benefits and challenges of resilience-building in developing countries. In one hand we have the Benefits of Implementing a Resilient National Framework where we can highlight the following dimensions:

2.1. Enhanced Disaster Risk Reduction and Management

Developing countries are disproportionately affected by natural disasters, with vulnerable social groups often bearing the brunt of the impact (Cyr, 2005). A resilient national framework can mitigate these effects by integrating disaster risk reduction (DRR) strategies into national policies, thus reducing mortality rates and economic losses.

The Sendai Framework for Disaster Risk Reduction (2015-2030) highlights the necessity of strengthening governance at all levels to minimize disaster risks, which is particularly critical in developing nations where local implementation remains a weak point (Smaldone et al., 2023; Pokharel et al., 2019). Strengthening institutional coordination and preparedness mechanisms ensures that developing nations can respond effectively to crises, rather than being caught in cycles of recovery and reconstruction.

2.2. Economic Resilience and Sustainable Development

A strong economic foundation is integral to national resilience. Research shows that economic resilience enables countries to absorb shocks and recover from disasters, reducing long-term financial losses (Rose, 2017). The 2011 Tohoku earthquake in Japan, for instance, underscores the importance of economic contingency planning and adaptive financial policies to ensure national stability.

Additionally, aligning resilience efforts with the United Nations Sustainable Development Goals (SDGs) strengthens national frameworks. Scown et al. (2023) emphasize that environmental sustainability goals (SDGs 2, 6, 13, 14, 15) are intrinsically linked to social-ecological resilience, reinforcing the need for integrated policy approaches that balance economic growth, environmental protection, and disaster preparedness.

2.3. Improved Governance and Institutional Capacity

A well-structured resilience framework enhances governance by promoting institutional coordination and strategic planning. For example, the Province of Potenza in Italy has implemented a multisectoral and multistakeholder model to improve resilience, an approach that has received international recognition and can serve as a blueprint for developing countries (Smaldone et al., 2023).

Moreover, cross-border collaborations and international partnerships can further strengthen governance mechanisms. Initiatives such as the European Union's Horizon 2020 program highlight the role of international cooperation in fostering resilience through knowledge-sharing and capacity-building programs (Kalliontzi et al., 2024).

2.4. Community Engagement and Social Inclusion

Resilience-building is most effective when local communities actively participate in shaping policies. Participatory approaches ensure that resilience frameworks address the specific needs of marginalized populations (Kalliontzi et al., 2024). By incorporating local knowledge and traditional risk management strategies, governments can build more inclusive and adaptable frameworks.

Urban resilience strategies also benefit from enhanced accountability and citizen engagement. Bruzzone et al. (2021) argue that involving the public in the design and implementation of resilience policies fosters greater trust in institutions, leading to more effective and sustainable resilience measures.

2.5. Technological Advancements and Innovation

Technology plays a crucial role in early warning systems, disaster response, and risk assessment. The integration of artificial intelligence, remote sensing, and geographic information systems (GIS) significantly improves decision-making and emergency response capacities in resource-constrained environments (Kalliontzi et al., 2024).

Additionally, Carlson et al. (2012) emphasize that technological resilience involves not only infrastructure development but also digital literacy and institutional readiness. By investing in technological innovation, developing countries can reduce vulnerabilities and enhance their ability to anticipate, absorb, and adapt to crises.

All these advantages, which can easily be seen as objectives to be achieved in these countries, face restrictions in the implementation of a national resilience framework, which are more or less clear and even different from country to country, but the literature does highlight the following:

2.6. Financial Constraints

Limited financial resources are a major barrier to implementing resilience frameworks. Without adequate funding, even the best-designed policies may fail (McGowan, 2014).

Many developing countries, particularly those along the belt and road initiative, struggle to allocate sufficient resources for

infrastructure resilience and disaster preparedness (Li et al., 2023). To bridge this "resilience deficit," countries need integrated financing mechanisms that combine domestic funding, international aid, and private sector investments.

2.7. Institutional and Governance Weaknesses

The effectiveness of resilience strategies depends on a government's ability to coordinate policies across multiple sectors. However, many developing nations suffer from institutional fragility, political instability, and bureaucratic inefficiencies, which significantly undermine resilience efforts (Smaldone et al., 2023).

Labaka et al. (2012) emphasize that a lack of clear policy frameworks and accountability mechanisms prevents governments from successfully implementing resilience strategies. Additionally, corruption and political unwillingness often divert resources away from resilience projects, weakening institutional capacity.

2.8. Cultural and Social Barriers

Cultural norms and sociopolitical structures influence how resilience strategies are perceived and adopted. In many communities, traditional risk management practices may conflict with modern resilience-building approaches, creating resistance to policy changes (Kalliontzi et al., 2024).

Additionally, Bruzzone et al. (2021) argue that low levels of awareness and understanding of resilience conceptshinder public engagement. Without effective communication and education campaigns, resilience strategies may fail to gain widespread community support.

2.9. Technological Limitations

Although technology has the potential to transform resilience-building, many developing countries lack the infrastructure and expertise to fully leverage technological innovations (Kalliontzi et al., 2024).

Carlson et al. (2012) highlight that data gaps, cybersecurity vulnerabilities, and a shortage of technical expertise can prevent the successful integration of digital tools into national resilience strategies. Overcoming these challenges requires long-term investment in digital capacity-building and knowledge transfer programs.

2.10. Political Instability and Conflict

Resilience-building efforts often struggle in politically unstable environments, where governance structures are weak, and national priorities shift rapidly. Ben Naseir et al et al. (2020) discuss the difficulties in establishing cybersecurity resilience in transitional economies, where instability creates additional barriers to resilience-building initiatives.

Similarly, Li et al. (2023) highlight that geopolitical conflicts and economic uncertainty can derail long-term resilience plans. Addressing these challenges requires stable governance, international cooperation, and adaptive policy strategies to ensure continuity in resilience efforts.

The main findings from this discussion highlight the need for integrated, evidence-based strategies to enhance resilience in the developing world. Governments, policymakers, and international organizations must work together to bridge the resilience gap, ensuring long-term sustainability and global security.

When we move from this more global discussion to one that is more centred on specific regional contexts such as the Bucharest Nine Countries, some adjustments become essential in order to understand not only their reality, but above all the knowledge gaps that still persist in this area.The B9 countries play a significant buffer role in deterring Russia's aggressive actions toward the EU. The resilience parameters of these countries largely determine and serve as a prerequisite for ensuring the economic, social, digital, and environmental resilience of the EU. While studies on individual countries' economic, environmental, and digital resilience are common, a comprehensive assessment of the resilience levels of the B9 countries is lacking—especially in the face of contemporary military challenges in Europe. This gap is filled by the current study.

Recent research (Giegerich and Nicoll, 2022; Volintiru et al., 2023) emphasizes NATO's role in ensuring security on the Alliance's eastern flank. The primary focus is on strengthening military presence and deterrence strategies. In particular, William (2024) highlights the growing importance of B9 military integration in response to Russia's aggressive actions.

In the context of building national and regional resilience, the development of agricultural service cooperatives in Ukraine illustrates how institutional factors can influence economic resilience. Gerasymenko et al. (2022) highlight that agricultural recovery and competitiveness depend not only on formal policy measures but also on the establishment of supportive informal institutions.

Academic studies (Maggo and Kumari, 2023; Krastev and Holmes, 2022) analyze the political dynamics and impact of populism in B9 countries. Their findings highlight challenges to democracy due to external disinformation threats and internal social divisions.

Turchyn and Ivasechko (2022) examine major security challenges for B9 countries, particularly in light of increasing threats on NATO's eastern borders. The authors stress the importance of collective defense and strengthening the Alliance's military potential. In this context, a NATO Resilience Symposium (2022) underscores the need to enhance defense readiness, expand military infrastructure, and improve coordination among B9 nations.

The ecological factors and sustainability as the resilience parameters in EU have been studied by Calafat-Marzal et al. (2025). The findings of the study highlight significant disparities across Europe in meeting established sustanability goals, both in efficiency levels and productivity growth. Notably, productivity gains are driven almost entirely by technological innovations, while optimizing resource use remains largely overlooked. Additionally, GDP per capita, employment rates, and active labor market policies emerge as the most influential resilience

factors affecting ecological efficiency. Limosani et al. (2025) further empasize that that prioritizing environmental sustainable development goals is strongly linked to higher short-term GDP growth, indicating that investments and reforms targeting environmental sustainability can also serve as key drivers of immediate economic gains.

The significance of digital resilience in today's world is explored in the work of Shkuropadska et al. (2025). The authors highlight that the development of digital infrastructure and cybersecurity mechanisms play a crucial role in ensuring the resilience of B9 countries. Foreign Policy Council "Ukrainian Prism." (n.d.). also addresses the issue of disinformation in Central and Eastern Europe, which threatens democratic processes and national security. The authors stress the need for national strategies to combat information threats.

The study by Shkuropadska et al. (2024) examines the impact of demographic resilience on economic development in Poland, the Czech Republic, Hungary, and Slovakia. The authors note that demographic issues, such as population aging and migration processes, may have long-term effects on the economic stability of the region. In particular, the B9 countries should develop policies aimed at supporting birth rates and attracting highly skilled migrants.

Boiko et al. (2022) analyze economic policy measures implemented by Poland, the Czech Republic, Slovakia, and Hungary during the COVID-19 pandemic. Their findings indicate that crisis measures included government support for businesses, stimulation of domestic demand, and strengthening of the financial sector. Meanwhile, Volintiru et. al. (2023) study examines economic resilience prospects in the region through the lens of transatlantic partnership. The authors emphasize that B9 countries should integrate their economic strategies with EU and NATO policies to mitigate global crisis risks.

The literature review demonstrates that B9 countries are actively developing resilience mechanisms, aligning with NATO and EU standards. However, a thorough assessment of resilience levels requires detailed identification of vulnerabilities and adaptive capacities in the face of crisis challenges.

3. METHODS

The study is based on an analysis of the Resilience Dashboards by the European Commission. (Resilience Dashboards, n.d.). The research employs both general and specialized methods, including the analysis and synthesis method for developing the study's concept and grouping individual research indicators. The analytical method, historical method, and comparison methods were used to analyse the resilience dashboards of the B9 countries.

EU resilience dashboards are conceptual tools and practical mechanisms used in the European Union to assess, monitor, and enhance the resilience of member states, infrastructure, and society in the face of contemporary challenges. They cover various aspects of resilience, including socio-economic, environmental, digital, and geopolitical dimensions.

The panels are used to identify weaknesses and development potential across various domains. They rely on key indicators that assess countries' vulnerabilities to different risks as well as their capacities for adaptation and response. The analysis of these indicators enables risk anticipation (socio-economic, environmental, digital, geopolitical) and the development of measures to mitigate their impact.

Socio-economic resilience is the ability of a country and society to maintain the stability and efficiency of their economic and social systems during crises, as well as to adapt to new conditions, minimizing losses and recovering from shocks. Socio-economic resilience is assessed in the following areas: Inequalities and social impact of the transitions, Health, education and work, Economic and financial stability and sustainability.

Environmental resilience refers to the ability of natural systems and society to adapt to environmental changes while maintaining their functionality and balance. It involves the long-term preservation of natural resources, minimizing negative environmental impacts, and efficiently using resources without harming ecosystems. Environmental resilience is assessed in the following areas: Climate change mitigation and adaptation, Sustainable use of resources, Ecosystems, biodiversity and sustainable agriculture.

Digital resilience is the ability of systems, infrastructures, and society as a whole to withstand digital threats and effectively utilize digital technologies to ensure stable functioning in the face of continuous changes, technological challenges, and crises. Digital resilience is assessed in the following areas: Digital for personal space, Digital for industry, Digital for public space, Cybersecurity.

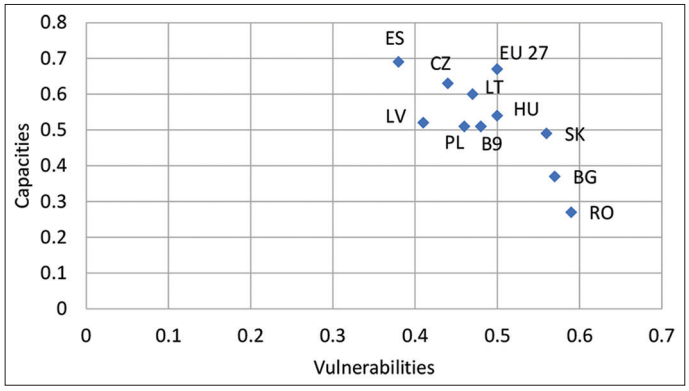
Geopolitical resilience is the ability of a country or region to effectively respond to geopolitical challenges while maintaining its stability, sovereignty, and security. It includes managing external and internal political threats, preserving strategic interests, and engaging with other states and international organizations. Geopolitical resilience involves the ability to adapt to changes in global politics and maintain a balance between national interests and international commitments. It is assessed in the following areas: Raw material and energy supply, Value chains and trade, Financial globalization, Security and demography.

Resilience dashboards are integrated into EU policies, including the European Green Deal, Digital Compass 2030, and the Recovery and Resilience Facility (RRF), which is funded through NextGenerationEU.

4. RESULTS

According to The Resilience dashboards the resilience level of EU countries is assessed using two main indices: Vulnerabilities Index and Capacities Index. The Vulnerabilities Index reflects the level of risks that may impact a country's resilience, while the Capacities Index characterizes a country's ability to withstand and adapt to

Figure 1: Resilience level of the B9 countries in 2022



Source: compiled by authors using (Resilience Dashboards, n.d.)

High to low vulnerabilities index	Low to high capacities index
0.8-1 – Lowest; 0.6-0.8 – Medium-low; 0.4-0.6 – Medium; 0.2-0.4 – Medium-high; 0-0.2 – Highest.	0-0.2 – Lowest; 0.2-0.4 – Medium-low; 0.4-0.6 – Medium; 0.6-0.8 – Medium-high 0.8-1 – Highest.

risks and crises. The resilience level of the B9 countries for 2022 is presented in Figure 1.

According to the Figure 1, the majority of B9 countries have a medium level of vulnerability (0.4-0.6): Bulgaria, Czechia, Hungary, Latvia, Lithuania, Poland, and Slovakia. Estonia exhibits an above-average level of vulnerability. Overall, the B9 countries have an average vulnerability level of 0.48, which aligns closely with the EU27 average of 0.50.

A below-average level of capacity (0.2-0.4) is characteristic of Bulgaria and Romania. A medium level of capacity (0.4-0.6) is typical for Hungary, Latvia, Lithuania, Poland, and Slovakia. Czechia and Estonia demonstrate above-average capacity levels (0.6-0.8). On average, the B9 countries have a capacity level of 0.51, while the EU27 average is 0.67, which is higher than the medium level.

For a detailed analysis of the capacities and vulnerabilities of the Bucharest Nine (B9) countries, let's examine the informational dashboards on socio-economic resilience, environmental resilience, digital resilience, and geopolitical resilience (Spring 2024 version, based on Eurostat data downloaded as of May 15, 2024). These dashboards will help assess both potential risks and strengths of the countries, which is crucial for developing recommendations to enhance their resilience levels.

4.1. Social and Economic Resilience of the B9 Countries

For each indicator classified as vulnerabilities or capacities, the dashboards illustrate the country's relative position in the latest available year, from the highest capacities/lowest vulnerabilities (dark blue) to lowest capacities/highest vulnerabilities (dark orange). The arrows in the dashboards indicate the direction of recent changes. An upward arrow indicates a sizeable improvement in resilience with respect to the preceding 5 years, while a downward arrow indicates a sizeable worsening. A dot indicates that no sizeable change has taken place over the most recent 5 years. An empty cell indicates that the 5-year change cannot be calculated (Resilience Dashboards, n.d.).

The EU Social and Economic Resilience Dashboard (Table 1) focuses on the following aspects of resilience:
Inequalities and social impact of the transitions.

- 1.1. Inequalities – this aspect shows economic, social, and regional disparities in access to resources, services, and opportunities. It includes differences in income, working conditions, housing, and poverty levels across various population groups.
- 1.2. Social Impact of the Transitions – refers to measures ensuring a fair distribution of benefits and minimizing the negative impacts of transitions on vulnerable groups.
  Health, education, and work.
- 2.1. Health – involves monitoring access to healthcare systems, life expectancy, physical and mental health indicators, and the system's readiness to respond to challenges such as pandemics or an aging population.
- 2.2. Education – measures the effectiveness, availability, and outcomes of education, including literacy rates, macroeconomic skills, and vocational training, ensuring adaptation to the rapidly changing labor market.
- 2.3. Work – focuses on employment, working conditions, labor productivity, the gender pay gap, and adaptation to evolving labor market conditions, such as automation or the increase of remote work.
  Economic and financial stability and sustainability.
- 3.1. Economic stability – key economic indicators such as GDP, inflation, economic productivity, and investments to assess the economy's resilience to internal and external shocks.
- 3.2. Financial stability – risks in the financial sector, including public debt levels, lending, banking system liquidity, and the ability to sustain long-term economic growth.
- 3.3. Sustainability – mechanisms for adapting to economic crises, maintaining macro-financial stability, and protecting economic sectors under force majeure conditions.

Analysis of data in the Table 1 shows improvements in all G9 countries in Long-term unemployment rate and Employment rate. Also there are improvements in resilience by the indicator of "At risk of poverty/social exclusion rate": 6 countries (BG, HU, LT, LV, PL, RO); "Children in formal childcare": 5 countries (BG, ES, LT, LV, PL); "Banking sector total capital ratio": 6 countries (CZ, HU, LV, PL, RO, SK).

At the same time, there are concerning negative trends in Healthcare and education, specifically in Heathcare the indicators of "Antimicrobial resistance": 5 countries (BG, ES, LT, LV, PL); "Standardised preventable and treatable mortality": 8 countries (all except ES). In Education "PISA test scores": 4 countries (BG, ES, PL, RO); "Variation in student performance based on socio-economic status": 6 countries (BG, CZ, PL, RO, SK).

Table 1: Social and economic resilience dashboard of the B9 countries (latest available year for each indicator up to 2022)

Class/indicator	BG	CZ	ES	HU	LT	LV	PL	RO	SK
Inequalities and social impact of the transitions									
(V) At risk of poverty or social exclusion rate (AROPE)	↑	•	•	↑	↑	↑	↑	↑	•
(V) Income quintile share ratio S80/S20	•	•	↑	•	↑	•	↑	↑	↑
(V) Employment in energy-intensive sectors	•	↑	•	•	•	•	↑	↑	•
(V) Employment in manufacturing with high automation risk									
(V) Regional dispersion in household income	↑	•		↓	↓		↑	•	↑
(C) Impact of social transfers (other than pensions) on poverty reduction	•	•	•	↓	↑	•	↑	•	•
(C) Household saving rate	•	↑	↓	↑	↑	•	↓		↓
(C) Government expenditures on education, health, and social protection	•	↑	•	•	↑	↑	•	↑	•
(C) Active citizenship									
Health, education and work									
(V) Antimicrobial resistance	↓	•	↓	•	↓	↓	↓		•
(V) Self-reported unmet need for medical care	↑	•	↑	•	•	↑	↑	↑	•
(V) Premature deaths due to exposure to fine particulate matter (PM2.5)	↑	•	•	•	•	•	•	•	•
(V) Variation in performance explained by students' socio-economic status	↓	↓	•	•	•	↑	↓	↓	↓
(V) Macroeconomic skills mismatch rate	↑	•	•	↑	↑	•	↑	•	•
(V) Gender employment gap	•	↑	↑	•	•	•	•	•	•
(V) Young people neither in employment nor in education and training									
(V) Long-term unemployment rate	↑	↑	↑	↑	↑	↑	↑	↑	↑
(C) Standardised preventable and treatable mortality (low rate)	↓	↓	•	↓	↓	↓	↓	↓	↓
(C) Healthy life years in absolute value at birth	•	•	•	↑	•	•	•	•	•
(C) Children (<3 years) in formal childcare	↑	•	↑	•	↑	↑	↑	•	•
(C) Average scores in the PISA test	↓	•	↓	•	•	•	↓	↓	•
(C) Adult participation in learning during the last 12 months									
(C) Employment rate	↑	↑	↑	↑	↑	↑	↑	↑	↑
(C) Active labour market policies per person wanting to work	↑	↑	↑	↓	•	•	↑	•	•
Economic and financial stability and sustainability									
(V) Government debt	•	•	•	•	•	•	•	•	•
(V) Projected old-age dependency ratio									
(V) Degree of specialization of the economy	•	↓	•	↓	↑	•	•	↓	↓
(V) Non-financial corporation debt to GDP ratio	↑	•	↑	•	•	↑	•	↑	•
(C) Income stabilisation coefficient	•	•	•	↓	↑	•	•	↑	•
(C) Banking sector total capital ratio	•	↑	↓	↑	•	↑	↑	↑	↑
(C) Insurance sector solvency capital ratio	↓	•	↓	↓	↓	↑	•	•	•
(C) Share of innovative enterprises									
(C) Intangible investment	↑	↑	↑	•	↑	↑	•	•	•
(C) Government investment to GDP ratio	↓	↑	•	↑	•	↓	•	↑	↓

Source: Compiled by authors using (Resilience Dashboards, n.d.)

Resilience	Change with regards to 2017
Highest capacities/lowest vulnerabilities	↑ Sizable improvement
Medium-high capacities/medium-low vulnerabilities	• Not sizable
Medium capacities/vulnerabilities	↓ Sizable worsening
Medium-low capacities/medium-high vulnerabilities	
Lowest capacities/highest vulnerabilities	
Not available	

With indicators showing a general decline in Standardised preventable and treatable mortality, governments should prioritize investments in primary healthcare services such as expanding access to routine health screenings, vaccinations, and community health programs.

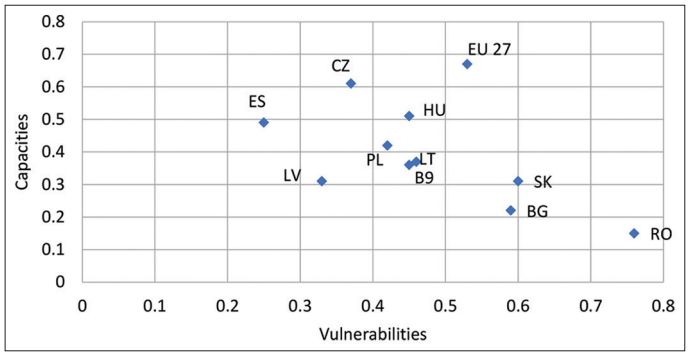
Country wise, Czech Republic generally shows good performance in socio-economic indicators. Bulgaria and Romania often demonstrate more vulnerabilities, but show improvement in social indicators. Poland has an increase in the vulnerability of Employment in energy-intensive sectors but generally good employment-related indicators. Baltic countries (Lithuania, Latvia) show progress in social protection and financial stability. Slovakia shows strong performance in banking sector as well as in general employment rates, but has some challenges in educational equality. Hungary has a notable improvement in poverty reduction and employment growth with the challenges in social transfers and healthcare access. Estonia shows strong performance in employment rates but has problems in the insurance sector.

Overall, the analysis shows a general pattern of resilience increase in Employment and social protection indicators, but concerning trends in Healthcare and education systems across the B9 countries.

The analysis of data presented in the Figure 2 shows that B9 countries have a medium level of capacities and vulnerabilities in socio-economic resilience with such quadrant distribution:

- Medium capacities, medium vulnerabilities (Middle quadrant): Czechia (CZ) is a leader in the category. Hungary (HU) and Estonia (ES) have the same level of capacities, but Hungary has lower vulnerabilities. Poland (PL) and Lithuania (LT) fall behind in this category, aligning closely with the B9

Figure 2: Social and economic resilience level of the B9 countries in 2022



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High to low vulnerabilities index	Low to high capacities index
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average. Latvia (LV) has a medium-high vulnerabilities and medium-low capacities.

- Medium-low vulnerabilities and medium-low capacities: Bulgaria (BG) and Slovakia (SK).
- Low capacities, low vulnerabilities (Bottom-right): Romania (RO) demonstrates the lowest vulnerabilities and the lowest capacities, indicating the lack incentive to promote capacities.

In general, Czechia (CZ) leads in socio-economic resilience with medium capacities and vulnerabilities. Romania (RO) demonstrates the lowest vulnerabilities and the lowest capacities, indicating the lack incentive to promote capacities in socio-economic sphere. The B9 average in socio-economic resilience falls behind the EU benchmark, highlighting the need for strategic investment in resilience capacities.

4.2. Green Resilience of the B9 Countries

The EU Green Resilience Dashboard (Table 2) focuses on environmental aspects of resilience, including:

Climate change mitigation and adaptation.

- 1.1. Climate change mitigation – measures to reduce or prevent greenhouse gas emissions. The approach includes transitioning to renewable energy sources, improving energy efficiency, reducing fossil fuel consumption, and developing carbon capture and storage technologies.
- 1.2. Adaptation – involves strategies designed to minimize the susceptibility of natural and human systems to the effects of climate change. Examples include strengthening infrastructure resilience to extreme weather events, promoting early warning systems for climate risks and using sustainable agricultural practices.
- 1.3. Sustainable use of resources – measures to ensure that Earth's resources, such as water, soil, minerals, and energy, are used efficiently and are not depleted. The key idea is to balance economic development with the conservation of resources for future generations.

Ecosystems, biodiversity, and sustainable agriculture.

- 3.1. Ecosystems – measures to maintain ecosystem health by preventing their degradation, protecting natural habitats, restoring degraded lands, and implementing ecosystem-based approaches to natural resource management.
- 3.2. Biodiversity – actions to preserve and restore the diversity of life on Earth, including plants, animals, and microorganisms, which are essential for ecosystem services such as air purification, pollination, and climate regulation.
- 3.3. Sustainable agriculture – transitioning to farming practices that minimize environmental harm, support biodiversity, reduce greenhouse gas emissions, and promote soil health.

Analysis of data in the Table 2 shows increase in all B9 countries in the capacity of Electric and hydrogen passenger fleet and Energy productivity. At the same time, there are negative trends across all G9 in the capacity of Inland use of train, bus and trolleybus and stable medium-low capacities in Environmental patents per capita. There is a positive universal trend across all B9 countries in decrease of vulnerability of Raw material consumption per capita.

The leaders in green resilience according to our analysis are Czechia and Estonia. Czechia has promoted its capacities in organic farming and in e-waste recycling. Estonia has a strong position in renewable energy consumption, energy productivity and good progress in organic farming.

At the same time, Bulgaria has a mixed performance in the indicators of waste management, some challenges in sustainable transport and positive trends in energy efficiency. Poland struggles with CO_2 emissions, has challenges in biodiversity preservation while having a good progress in e-waste recycling.

In the areas of Biodiversity there is a problem of Declining farmland bird populations; in Agricultural Sustainability - Farm income variability; Forest Management: declining CO_2 absorption capacity in several countries.

The analysis of data presented in the Figure 3 shows that the majority of B9 countries show medium capacities and medium-high vulnerabilities in green resilience with such quadrant distribution:

- Medium-high capacities, meduim-low vulnerabilities (Top-right quadrant): Estonia (ES), Czechia (CZ). These are the green resilience leaders among the B9 countries. Their capacities allow them to handle vulnerabilities effectively. Estonia makes an examples of coping with environmental challenges effectively.
- Medium capacities, medium vulnerabilities (Middle quadrant): Hungary (HU), Poland (PL). - Medium Capacities, Medium-high Vulnerabilities: Slovakia (SK), Latvia (LV), Lithuania (LT). These countries represent average performance in green resilience. They need improvements in their green policies and infrastructure to reduce vulnerabilities while increasing capacities.
- Medium-low capacities, medium-high vulnerabilities

Table 2: Green resilience dashboard of the B9 countries (latest available year for each indicator up to 2022)

Class/indicator	BG	CZ	ES	HU	LT	LV	PL	RO	SK
Climate change mitigation and adaptation									
(V) Fatalities from climate extremes	•	•	•	•	•	•	•	•	•
(V) GHG emissions per capita	•	•	↑	•	•	•	•	•	•
(V) CO_2 emissions in road transport	↓	•	•	↓	•	•	↓	↓	•
(V) Fossil fuel subsidies	↑	↑	↑	↓	↑	↑	↑	↓	↑
(C) Insured losses from climate extremes	•	•	•	•	↓	↓	•	•	•
(C) CO_2 absorption by forests	•	↓	↑	•	↓	↓	•	•	↑
(C) Electric and hydrogen passenger fleet	↑	↑	↑	↑	↑	↑	↑	↑	↑
(C) Inland use of train, bus and trolleybus	↓	↓	↓	↓	↓	↓	↓	↓	↓
(C) Renewable energy in final energy consumption	•	•	↑	•	↑	↑	↑	•	↑
(C) Environmental patents per capita	•	•	•	•	•	•	•	•	•
Sustainable use of resources									
(V) Water exploitation index +	•	•	•	•	•	•	•	↑	•
(V) Consumption footprint per capita	↓	↓	•	•	↓	↓	↓	•	↓
(V) Raw material consumption per capita	↓	↓	↓	↓	↓	↓	↓	↓	•
(V) Waste generation rate	↑	↓	↑	•	•	•	•	↑	•
(V) Energy used in ICT	•	↓	↓	↑	↓	•	•	↑	•
(C) Resource productivity	•	↑	↑	↑	•	•	↑	•	↑
(C) Energy productivity	↑	↑	↑	↑	↑	↑	↑	↑	↑
(C) Circular material use rate	•	↑	↑	•	•	•	↓	•	↑
(C) E-waste recycling rate	↑	↑	•	↓	•	↑	↑	↑	↑
(C) Gross value added in environmental goods and services sector	↑	↑	•	↓	↑	•	•	•	
Ecosystems, biodiversity and sustainable agriculture									
(V) Farmland bird index		↓	↓	•	↓	↓	↓		↓
(V) Harmonised risk indicator 1 for pesticides	•	↑	↑	↑	↑	•	↑	↑	↑
(V) Soil sealing index	•	•	•	•	•	•	•	•	•
(V) Soil erosion by water									
(V) Farm income variability	↓	↓	↓	↓	↓	↑	↓	↓	•
(C) Soil carbon content	•	•	•	•	•	•	•	•	•
(C) Organic farming	•	↑	↑	↑	↑	↑	•	↑	↑
(C) Urban wastewater treatment	•	•	•	↑	•	•	•	↑	•
(C) Natura 2000 protected areas	•	•	•	•	•	•	•	•	•
(C) National expenditures on environmental protection	↓		↓				↑	↑	

Source: Compiled by authors using (Resilience Dashboards, n.d.)

Resilience	Change with regards to 2017
Highest capacities/lowest vulnerabilities	↑ Sizable improvement
Medium-high capacities/medium-low vulnerabilities	• Not sizable
Medium CAPACITIES/vulnerabilities	↓ Sizable worsening
Medium-low capacities/medium-high vulnerabilities	
Lowest capacities/highest vulnerabilities	
Not available	

(Bottom-left quadrant): Bulgaria (BG), and Romania (RO). These countries struggle with insufficient capacities to address environmental risks while having high vulnerabilities.

4.3. Digital Resilience of the B9 Countries

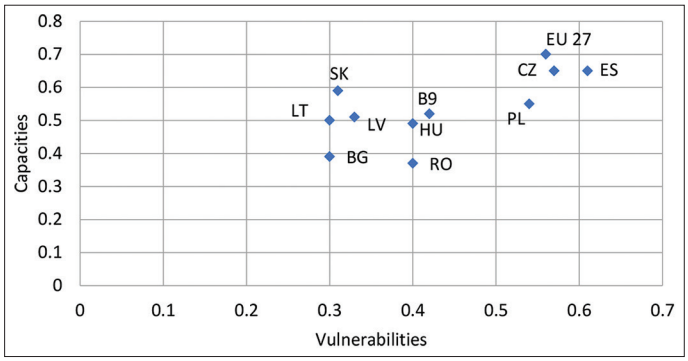
The EU digital resilience dashboard focuses on key aspects of digital resilience across various areas of digital transformation, including:

- Digital for personal space – measures related to the protection of digital rights, data, and citizens' security in their personal digital environment.
- Digital for industry – measures aimed at implementing digital solutions to enhance productivity, innovation, and competitiveness of European industry.
- Digital for public space – measures focused on digital tools to ensure transparency, accessibility, and efficiency in public administration.
- Cybersecurity – measures encompassing the protection of digital infrastructure and data from cyber threats.

Analysis of data in the Table 3 shows improvements in all G9 countries in Global Cybersecurity Index and improvement in majority of countries in the indicators of the Use of online courses, Social network usage, Young people engaging in online learning activities, Master graduates in ICT.

Bulgaria has improvements in E-commerce sales, in ICT sector gross value added and has some challenges in Broadband access. Czech Republic has strong improvements in managing ICT trade deficit, increasing online course usage. Estonia

Figure 3: Green resilience level of the B9 countries in 2022



High to low vulnerabilities index	Low to high capacities index
0.8-1 – Lowest; 0.6-0.8 – Medium-low; 0.4-0.6 – Medium; 0.2-0.4 – Medium-high; 0-0.2 – Highest.	0-0.2 – Lowest; 0.2-0.4 – Medium-low; 0.4-0.6 – Medium; 0.6-0.8 – Medium-high 0.8-1 – Highest.

has advancements in digital skills development, ICT sector performance, e-commerce and online learning. Hungary has a mixed digital performance, decline in ICT sector business R&D and Enterprises seeking ICT specialists. Lithuania has consistent improvements in cybersecurity awareness, e-commerce sales. Latvia and Poland are strong in digital competencies, has a growing ICT sector performance and gross value added. Romania is improving in managing ICT trade deficit and increasing ICT sector gross value added, but has some gaps in online public services. Slovakia has a steady digital transformation, growing ICT sector but some limitations in social network usage.

Generally, across all B9 countries there are broadband access disparities, limited online public services and varying cybersecurity incident levels. The B9 countries demonstrate significant digital resilience improvements, with most indicators showing positive trends.

The analysis of data presented in the Figure 4 shows that B9 countries have medium capacities and vulnerabilities in digital resilience with such quadrant distribution:

- High capacities, medium-high vulnerabilities (Top-left quadrant): Estonia (ES): Estonia is the digital leader of the B9, with advanced digital infrastructure and governance. However, its relatively higher vulnerabilities suggest exposure to risks like cyber threats.
- Medium capacities, Medium Vulnerabilities (Middle quadrant): Czechia (CZ), Latvia (LV), Lithuania (LT), Slovakia (SK) fall in the category of that is B9 and EU average. These countries demonstrate a moderate level of digital resilience, balancing digital infrastructure and innovation against potential weaknesses like uneven access or cybersecurity gaps.
- Medium capacities, Medium-low Vulnerabilities (Bottom-right quadrant): Hungary (HU), Poland (PL). While their vulnerabilities are not critically high, the countries exhibit medium capacities to cope with them.
- Medium-low Capacities with Medium-low Vulnerabilities (Bottom-right quadrant): Bulgaria (BG), Romania (RO) show and adequate answer in resilience to not critical vulnerabilities.

Overall, Estonia (ES) has a highest digital resilience among B9 countries. Bulgaria (BG) and Romania (RO) show low capacities in digital resilience that is correspondent to their low digital vulnerabilities.

The policy recommendations to support digital resilience in B9 countries are:

- To expand broadband infrastructure: address disparities focusing on expanding high-speed internet infrastructure, particularly in underserved areas, to ensure equitable digital access for all citizens.
- To enhance cybersecurity by increasing cybersecurity training, public awareness, and incident response capabilities to manage varying cybersecurity incident levels.
- To upgrade online public services: develop and expand user-friendly digital government services to improve accessibility and responsiveness, ensuring citizens can easily engage with online public services.

4.4. Geopolitical Resilience of the B9 Countries

The EU geopolitical resilience dashboard focuses on monitoring and strengthening the European Union's resilience to geopolitical challenges, including:

Raw material and energy supply – measures ensuring sustainable access to key resources and energy for the EU economy.

Value chains and trade – measures ensuring the resilience of trade and competitiveness of European supply chains.

Financial globalisation – measures aimed at integrating the EU's financial system into global markets while maintaining its resilience to shock impacts.

Security and demography – measures related to the security of the population and long-term demographic trends affecting societal resilience.

Analysis of data in the Table 4 shows improvements in majority of G9 countries in the indicators of Intra-EU trade in recyclable raw materials, Intra-EU trade in energy, have stable increase in Military expenditures, Net migration rate and decrease in Net lending/borrowing.

Country-specific analysis shows that Bulgaria has improvements in intra-EU trade, migration rates. Czech Republic has good performance in supplier diversification, increased military expenditure. Estonia has good performance in metal footprint management, good supplier diversification but mixed FDI concentration results. Hungary is improving trade openness but has some challenges in financial integration. Lithuania has an increase in armed forces personnel and issues with energy

Table 3: Digital resilience dashboard of the B9 countries (latest available year for each indicator up to 2022)

Class/indicator	BG	CZ	ES	HU	LT	LV	PL	RO	SK
Digital for personal space									
(V) Enterprises without ICT training programs	•	•	↑	•	↑	↑	↑	↑	•
(V) Employees not using telework									
(V) Inadequacy of ICT training for teachers									
(C) Collaborative economy									
(C) Advanced digital competence of adults									
(C) Advanced digital competence of young people									
(C) Use of online courses	↑	↑	↑	↑	↑	↑	↑	•	↑
(C) Use of social networks	↑	↑	↑	↑	↑	↑	↑	↑	•
(C) Young people doing any online learning activity	↑	↑	↑	↑	•	↑	↑	↑	↑
(C) Master graduates in ICT	↑	•	↑	↑	•	↑	↑	↑	↑
Digital for industry									
(V) ICT trade deficit in goods	↓	↓	↑	↓	↓	↓	↓	↓	↓
(V) ICT trade deficit in services	↑	↑	↑	↑	↑	↑	↑	↑	↑
(V) ICT specialist gender gap									
(V) Lack of cloud services									
(V) Broadband access gap by company size	↑	↓	•	↓	↓	↓	•	↑	↑
(C) Investment per employee, high-technology sectors	•	•	•	•	•	•	•	•	
(C) Enterprises seeking ICT specialists	•	↑	•	↓	•	•	•	↑	•
(C) Gross value added in ICT	↑	↑	↑	•	↑	↑	↑	↑	↑
(C) ICT sector business enterprise R&D (BERD)	↑	↑	↑	↓	↑	↓	•	↑	↑
(C) Value of e-commerce sales	↑	•	•	•	↑	↑	↑	↑	↑
Digital for public space									
(V) Lack of 5G readiness									
(V) Lack of online public services for businesses									
(V) People not having access to digital public services	•	↑	↑	↑	↑	↑	↑	•	•
(V) Broadband access gap, urban versus rural	↑	↑	•	↑	↑	↑	↑	↑	↑
(C) E-health	↑	↑	↑	↑	↑	↑	↑	•	↑
(C) Judicial system e-tools									
Cybersecurity									
(V) Cybersecurity incidents experienced by people	↑	↑	•	↓	↑	↑	↑	↑	•
(V) ICT security incidents in enterprises		↑							
(C) Cybersecurity awareness of individuals	•		↑	↑	↑	↑	↑	•	↑
(C) Global Cybersecurity Index	↑	↑	↑	↑	↑	↑	↑	↑	↑

Source: Compiled by authors using (Resilience Dashboards, n.d.)

Resilience	Change with regards to 2017
Highest capacities/lowest vulnerabilities	↑ Sizable improvement
Medium-high capacities/MEDIUM-low vulnerabilities	• Not sizable
Medium capacities/vulnerabilities	↓ Sizable worsening
Medium-low capacities/medium-high vulnerabilities	
Lowest capacities/highest vulnerabilities	
Not available	

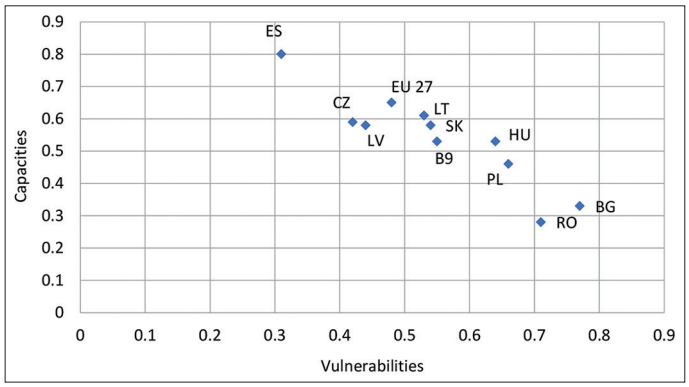
supplier diversification. Latvia is improving intra-EU trade, has rising net migration and challenges in supplier diversification. Poland is increased rate of change in supplier diversification for energy carriers and improving financial integration. Romania is improving value added from foreign enterprises but has challenges in supplier diversification. Slovakia is improving trade openness but has issues with energy carrier supplier diversification.

The analysis of data presented in the Figure 5 shows that B9 countries have a medium capacities and vulnerabilities in geopolitical resilience with such quadrant distribution:

- Medium-high capacities, medium vulnerabilities (Middle): Czechia (CZ), Lithuania (LT), Latvia (LV), Estonia (ES), Hungary (HU) and Bulgaria (BG) are clustered in this quadrant, demonstrating moderate resilience that is close to EU avarage. These countries balance their capacities and vulnerabilities.
- Medium capacities and medium-low vulnerabilities: Slovakia (SK).
- Medium capacities and medium-high vulnerabilities: Poland (PL).
- Medium-Low Capacities, medium-high vulnerabilities (Bottom-left): Romania (RO). Romania is characterized by low geopolitical resilience due to medium-low capacities with medium-high vulnerabilities. This suggests a relatively stable but weakly resistant position, potentially due to limited external geopolitical engagement or exposure.

Overall, B9 countries show medium geopolitical resilience with Hungary, Estonia, Lithuania, Latvia having the medium-high capacities with the lowest vulnerabilities in B9 and Romania being the weakest in capacities with highest vulnerabilities.

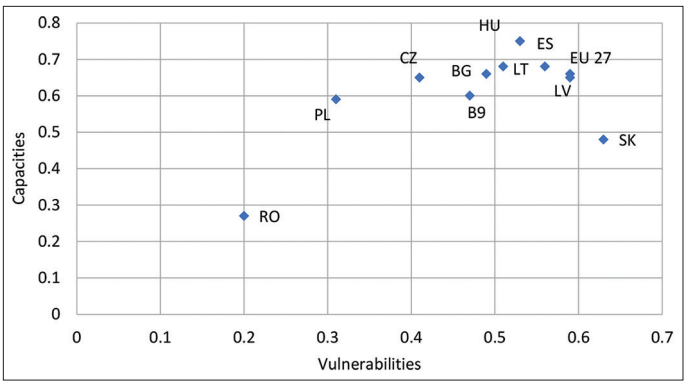
Figure 4: Digital resilience level of the B9 countries in 2022



Source: compiled by authors using (Resilience Dashboards, n.d.)

High to low vulnerabilities index	Low to high capacities index
0.8-1 – Lowest; 0.6-0.8 – Medium-low; 0.4-0.6 – Medium; 0.2-0.4 – Medium-high; 0-0.2 – Highest.	0-0.2 – Lowest; 0.2-0.4 – Medium-low; 0.4-0.6 – Medium; 0.6-0.8 – Medium-high 0.8-1 – Highest.

Figure 5: Geopolitical resilience level of the B9 countries in 2022



Source: compiled by authors using (Resilience Dashboards, n.d.)

High to low vulnerabilities index	Low to high capacities index
0.8-1 – Lowest; 0.6-0.8 – Medium-low; 0.4-0.6 – Medium; 0.2-0.4 – Medium-high; 0-0.2 – Highest.	0-0.2 – Lowest; 0.2-0.4 – Medium-low; 0.4-0.6 – Medium; 0.6-0.8 – Medium-high 0.8-1 – Highest.

The policies recommendations to strengthen geopolitical resilience include promoting policies that facilitate intra-EU trade in recyclable raw materials and energy; maintain balanced approach to military expenditures to support national defense and contribute to regional stability without compromising fiscal health; leverage positive trends in net migration by developing policies that attract skilled labor and support effective integration.

5. DISCUSSION

The resilience of the Bucharest Nine (B9) countries in the face of global turbulence presents a multifaceted challenge, requiring a comprehensive assessment across socio-economic, environmental, digital, and geopolitical dimensions. The results of this research reveal key vulnerabilities and capacities within these domains, with notable trends and country-specific variations that warrant further exploration.

5.1. Socio-Economic Resilience

The findings indicate that the majority of B9 countries exhibit medium levels of socio-economic resilience. Improvements in employment and poverty reduction metrics contrast with persistent challenges in healthcare and education. The Czech Republic emerges as the most resilient in this category, displaying medium-high capacities and moderate vulnerabilities. Conversely, Romania demonstrates the lowest capacities, reflecting systemic challenges in social protection and labor market adaptability. The declining trends in standardized preventable and treatable mortality rates across the region highlight the urgent need for enhanced healthcare infrastructure and preventive medical programs. Investments in education, particularly in reducing socio-economic disparities in student performance, should be prioritized to foster long-term resilience.

5.2. Environmental Resilience

Green resilience remains a critical concern, with most B9 countries struggling to meet EU sustainability benchmarks. Estonia, the Czech Republic, and Poland perform relatively well, yet still lag behind the EU27 average. Bulgaria and Romania face significant environmental challenges, necessitating urgent policy interventions. While all B9 countries have improved their electric and hydrogen passenger fleet capacities, the persistent decline in inland train and bus usage signals inefficiencies in sustainable transport infrastructure. Additionally, medium-low capacities in environmental innovation, as reflected in low environmental patent production, point to gaps in research and development investments. Addressing these weaknesses through targeted policies could enhance the region's ability to mitigate climate risks and achieve long-term sustainability goals.

5.3. Digital Resilience

Digital transformation efforts have yielded promising results across the B9 countries, with notable improvements in cybersecurity, ICT education, and e-commerce expansion. Estonia leads in digital resilience, benefiting from advanced e-governance infrastructure and cybersecurity preparedness. However, digital disparities persist, particularly in broadband access and the availability of online public services in Bulgaria and Romania. While progress has been made in enhancing ICT sector value-added contributions, challenges remain in bridging the urban-rural digital divide. Strengthening digital infrastructure and expanding digital literacy programs are key strategies for bolstering resilience in this sector.

5.4. Geopolitical Resilience

Geopolitical resilience across the B9 countries is shaped by external threats and strategic dependencies, particularly concerning energy security and trade vulnerabilities. The study highlights improvements in intra-EU trade in recyclable raw materials and energy, alongside increased military expenditures as a response

Table 4: Geopolitical resilience dashboard of the B9 countries (latest available year for each indicator up to 2022)

Class/indicator	BG	CZ	ES	HU	LT	LV	PL	RO	SK
Raw material and energy supply									
(V) Metal footprint per capita	↓	•	↓	•	•	•	•	•	•
(V) Supplier concentration in base metals	•	•	↑	↑	↑	↑	•	•	↑
(V) Import dependence in energy materials	•	↓	•	•	•	•	↓	↓	↓
(V) Supplier concentration in energy carriers	•	•	•	•	•	•	↑	•	•
(C) Intra-EU trade in recyclable raw materials	↑	↑	↑	↑	↑	↑	↑	•	↑
(C) Supplier diversification for base metals, rate of change	•	↑	↑	↓	↑	↓	•	↓	•
(C) Metal footprint per capita, rate of decline	↓	↓	↑	↑	↑	↑	•	•	↑
(C) Intra-EU trade in energy	↑	↑	↑	↑	↓	↑	↑	↑	↑
(C) Supplier diversification for energy carriers, rate of change	•	↑	↑	↑	↓	↑	↑	↓	↓
Value chains and trade									
(V) Concentration of value chain partners	↑	•	•	•	•	•	•	•	↓
(V) Extra-EU import partner concentration	↑	↓	•	↓	↑	•	•	•	•
(V) Extra-EU export partner concentration	↑	↑	↑	•	↑	↑	↑	•	↑
(C) Backward participation in GVC	•	•	•	•	•	•	↑	•	•
(C) Forward participation in GVC	↑	•	↑	•	↑	↑	•	•	•
(C) Trade openness – intra-EU	•	•	↑	•	↑	↑	↑	•	↑
(C) Trade openness – extra-EU	↑	•	↑	↑	↑	•	↑	•	↑
Financial globalisation									
(V) Inward FDI partner concentration		↓	↑	↑	•	↓	•		•
(V) Outward FDI partner concentration		↑	•	•	↑	•	↑		↓
(V) Net lending/borrowing	↓	↓	↓	↓	↓	↓	↓	↓	↓
(V) Net International Investment Position	↑	•	•	•	↑	↑	↑	•	•
(C) Value added share of foreign enterprises	•	•	•	↓	•	•	↑	↑	•
(C) Financial integration	•	•	•	↓	•	•	↑	•	•
Security and demography									
(V) Disinformation originating from abroad	•	•	•	↑	•	↑	↓	↓	↓
(V) Total fertility rate (difference from replacement-level)	↑	•	•	↑	↓	↓	↓	•	↑
(V) Employment gap (EU versus non-EU nationals)									
(V) Military expenditures (difference from 2% of GDP)	↑	↑		↑	↑	↑	↑	↑	↑
(C) Armed forces personnel	•	•	•	•	↑	↑	•	•	•
(C) Net migration rate	↑	↑	↑	•	↑	↑	↑	↑	•
(C) Share of non-EU citizens in total employment									
(C) People being resettled under AMIF									

Source: Compiled by authors using (Resilience Dashboards, n.d.)

Resilience	Change with regards to 2017
Highest capacities/lowest vulnerabilities	↑ Sizable improvement
Medium-high capacities/medium-low vulnerabilities	• Not sizable
Medium capacities/vulnerabilities	↓ Sizable worsening
Medium-low capacities/medium-high vulnerabilities	
Lowest capacities/highest vulnerabilities	
Not available	

to regional security concerns. Hungary, Estonia, Lithuania, and Latvia demonstrate the highest geopolitical capacities, while Romania remains the most vulnerable. The concentration of energy supply chains and the reliance on external trade partners pose risks that necessitate diversification strategies. Further, maintaining a balanced approach to military expenditure while ensuring fiscal sustainability is crucial for long-term stability.

Thus, in terms of policy implications and future developments, the overall resilience assessment underscores the need for targeted policy interventions across all dimensions. Socio-economic resilience can be strengthened by enhancing healthcare accessibility and educational quality. Environmental resilience requires greater investments in green technologies and sustainable infrastructure. Digital resilience improvements should focus on reducing regional disparities in broadband access and public digital services. Finally, geopolitical resilience can be reinforced by diversifying energy sources and fostering strategic trade partnerships within the EU framework.

Future research should explore the effectiveness of specific policy measures in addressing these vulnerabilities. Comparative analyses with non-B9 EU countries could provide deeper insights into best practices and resilience-building strategies applicable to the region. Additionally, examining the long-term impacts of geopolitical instability on resilience dynamics will be crucial for anticipating future challenges and adapting policy frameworks accordingly.

6. CONCLUSION

The majority of B9 countries have a medium level of vulnerability: Bulgaria, Czechia, Hungary, Latvia, Lithuania, Poland, and Slovakia. Estonia exhibits an above-average level of vulnerability. Overall, the B9 countries have an average vulnerability level of 0.48, which aligns closely with the EU27 average of 0.50.

A below-average level of capacity is characteristic of Bulgaria and Romania. A medium level of capacity is typical for Hungary, Latvia, Lithuania, Poland, and Slovakia. Czechia and Estonia demonstrate above-average capacity levels. On average, the B9 countries have a capacity level of 0.51, while the EU27 average is 0.67, which is higher than the medium level.

The results of analysis show that B9 countries have a medium level of social-economic resilience. The indicators that have a stable improvement in this category are decline in Long-term underemployment and consequent increase in Employment rate in all B9 countries. The most problematic areas are health and education with the general decrease in the indicator of Standardised preventable and treatable mortality and medium capacity in indicator of Healthy life years in absolute value at birth. The most resilient country in this category is Czechia with medium-high capacities and medium vulnerabilities, the least resilient is Romania demonstrates the lowest vulnerabilities and the lowest capacities, indicating the lack of incentive to promote capacities. The policy recommendations to cope with vulnerabilities in socio-economic sphere will be to concentrate upon the problems in health and education, namely to expand access to routine health screenings, vaccinations, and community health programs and to prioritise investments in development of education.

B9 countries show a medium capacities and medium-high vulnerabilities in green resilience. Top performers are Estonia, Czechia, Poland, that have higher capacities and lower vulnerabilities than average in B9 countries, but lower still than EU27 average. Bulgaria and Romania face significant challenges in terms of medium-low capacities and medium-high vulnerabilities. They require immediate action to enhance their environmental governance, build green infrastructure, and address policy gaps. There is an increase in all B9 countries in the capacity of Electric and hydrogen passenger fleet usage and Energy productivity. At the same time, there are negative trends across all B9 in the capacity of Inland use of train, bus and trolleybus and stable medium-low capacities in Environmental patents per capita. There is a positive universal trend across all B9 countries in decrease of vulnerability of Raw material consumption per capita.

B9 countries have a medium capacities and vulnerabilities and demonstrate significant digital resilience improvements, with most indicators showing positive trends. There are positive trends in all B9 countries in Global Cybersecurity Index and improvement in majority of countries in the indicators of the use of Online courses, Social network usage, Young people engaging in online learning activities, Master graduates in ICT. The negative trends are Broadband access disparities, Limited online public services and varying cybersecurity incident levels. Estonia has a highest digital resilience level among B9 countries. Bulgaria and Romania show low capacities in digital resilience that is correspond to their low digital vulnerabilities.

B9 countries have a medium performance in geopolitical resilience with improvements in majority of countries in the indicators of Intra-EU trade in recyclable raw materials, Intra-EU trade in energy, stable increase in Military expenditures, Net migration rate and decrease in Net lending/borrowing. Hungary, Estonia, Lithuania, Latvia have the highest capacities and lowest vulnerabilities in B9. Romania remains being the weakest in capacities with highest vulnerabilities.

The further research within the estimation of resilience level of B9 countries in the fields of socio-economic, green, digital and geopolitical resilience should focus on the effectiveness analysis of specific policy actions concerning the above mentioned spheres.

REFERENCES

Ben Naseir, M. A., Dogan, H., Apeh, E. (2021), Assessment of national cybersecurity capacity for countries in a transitional phase: The Spring land case study. In modern management based on Big Data II and machine learning and intelligent systems III. IOS Press. https://doi.org/10.3233/FAIA210242

Boiko, A., Umantsiv, Y., Cherlenjak, I., Prikhodko, V., Shkuropadska, D. (2022), Policy measures for economic resilience of visegrad group and Ukraine during the pandemic. Problems and Perspectives in Management, 20(2), 71-83.

Bruzzone, M., Dameri, R.P., Demartini, P. (2021), Resilience reporting for sustainable development in cities. Sustainability, 13(14), 7824.

Calafat-Marzal, C., Vega, V., Sanz-Torro, V., Puertas, R. (2025), Assessment of the resilience factors associated with European green efficiency. Science of The Total Environment, 966, 178643.

Carlson, J.L., Haffenden, R.A., Bassett, G.W., Buehring, W.A., Collins Iii, M.J., Folga, S.M., Petit, F., Phillips, J.A., Verner, D.R., Whitfield, R.G. (2012), Resilience: Theory and Application. United States: Argonne National Laboratory, Argonne, IL.

Foreign Policy Council "Ukrainian Prism." (n.d.). Disinformation Resilience in Central and Eastern Europe (DRI-CEE). Retrieved from https://prismua.org/en/dri-cee/

Gerasymenko, A., Ozhelevskaya, T., Lebedeva, L., Moskalenko, O. (2022), Agricultural service cooperatives in Ukraine: Institutional development drivers. Scientific Horizons, 25(6), 89-99.

Cyr, J.F.S. (2005), At risk: Natural hazards, people's vulnerability, and disasters. Journal of Homeland Security and Emergency Management, 2(2), 1131.

Giegerich, B., Nicoll, A. (2022), The struggle for NATO's soul. Survival, 64(5), 7-28.

Kalliontzi, E., Kouskoura, A., Katsaros, E. (2024), Perspective chapter: Advancements in disaster risk. In: Climate Change and Risk Management-Strategies, Analysis, and Adaptation: Strategies, Analysis, and Adaptation. Vol. 27. London: InTechOpen, P1005847.

Krastev, I., Holmes, S. (2022), "The Light that Failed: A Reckoning". Penguin Books. Available from: https://www.penguin.co.uk/books/312/312168/the/light/that/failed/9780141988108.html

Labaka, L., Hernantes, J., Laugé, A., Sarriegi, J.M. (2012), Resilience: Approach, definition and building policies. In: Future Security: 7th Security Research Conference, Future Security 2012, Bonn,

Germany, September 4-6, 2012. Berlin Heidelberg: Springer, p509-512.
Li, J., Yuan, J., Suo, W. (2023), National resilience assessment and improvement based on multi-source data: Evidence from countries along the belt and road. International Journal of Disaster Risk Reduction, 93, 103784.
Limosani, M., Millemaci, E., Mustica, P. (2025), Do green policies enhance short-term economic growth? Assessing EU recovery and resilience plans through the lens of sustainable development goals. Economic Modelling, 107, 107044.
Maggo, R., Kumari, S. (2023), The rise of populism in central and eastern Europe: The gaining power bond between hungary and Poland in the European union. Social Development and Security, 13(3), 206-217.
McGowan, J. (2014), Promoting resilience: A contemporary and integrated policy and funding framework for disaster management. Australian Journal of Emergency Management, 29(2), 8-10.
NATO Resilience Symposium: Report (May 4-6, 2022, Warsaw, Poland) (2022). Available from: https://www.act.nato.int/wp-content/uploads/2023/05/20221018_resilience_symposium_report-1.pdf
Pokharel, S., Spencer, C., McArdle, D., Archer, F. (2019), Global consensus frameworks, standards, guidelines, and tools: Their implications in international development policy and practice. Prehospital and Disaster Medicine, 34(6), 644-652.
Resilience Dashboards by the European Commission. (n.d.), Resilience Dashboards. Available from: https://commission.europa.eu/strategy/and/policy/strategic/foresight/2020/strategic-foresight-report/resilience-dashboards_en
Rose, A. (2017), Economic resilience in regional science: Research needs and future applications. In: Regional Research Frontiers, Innovations, Regional Growth and Migration. Vol. 1. Berlin: Springer, p245-264.
Scown, M.W., Craig, R.K., Allen, C.R., Gunderson, L., Angeler, D.G., Garcia, J.H., Garmestani, A. (2023), Towards a global sustainable development agenda built on social-ecological resilience. Global Sustainability, 6, e8.
Shkuropadska, D., Lebedeva, L., Shtunder, I., Ozhelevskaya, T., Khrustalova, V. (2024), The impact of demographic resilience on the economic development of countries (on the example of the visegrad group countries). Financial and Credit Activity Problems of Theory and Practice, 1(54), 552-563.
Shkuropadska, D., Tokar, V., Purdenko, O., Lotariev, A., Savchuk, K. (2025), Digital resilience of the bucharest nine and ukraine. International Journal of Economics and Financial Issues, 15(1), 24-31.
Smaldone, R., Attolico, A., Scorza, F. (2023), Enhancing territorial and community resilience through a structured institutional governance: The resilience HUB of the province of Potenza. In: International Conference on Computational Science and Its Applications. Cham: Springer Nature Switzerland, p 25-39.
Turchyn, Y., Ivasechko, O. (2022), Challenges for cooperation of the participating states in the Bucharest Nine format in the conditions of the evolution of security threats on NATO's eastern borders. SHV, 8(1), 7-12.
Volintiru, C., Crişan, C., Ştefan, G. (2023), Scaling up the Transatlantic Partnership from Security to Prosperity: Economic Resilience in Eastern Europe. Available from: https://www.atlanticcouncil.org/in/depth/research/reports/books/scaling/up/the/transatlantic/partnership-from-security-to-prosperity-economic-resilience-in-eastern-europe
William, C. (2024), NATO's Eastern Flank: Challenges and Implications in the Context of the Ukraine War. Available from: https://www.cips/cepi.ca/event/natos/eastern/flank/challenges/and/implications/in/the/context/of/the/ukraine/war