

*Pregledni članak*

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## **GREEN TRANSITION AND FINANCIAL STABILITY: CASE STUDY OF THE REPUBLIC OF SERBIA**

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### **Summary**

*The concept of the green transition is becoming more and more significant in the context of international initiatives to protect the environment and promote sustainable economic growth. The Republic of Serbia has to cope with the potential and difficulties presented by this shift, particularly with regard to financial stability. The green transition refers to the adoption of policies that support sustainable production and consumption as well as the switch from conventional, fossil fuel-based energy sources to renewable ones. Existing financial institutions and markets may be under pressure as a result of this change, which could have a major impact on the nation's economic structure. On the other hand, financial stability is an essential component of every economic system since it guarantees the continuation of economic activity and safeguards against a variety of risks. The paper's objectives are to examine the relationships between financial stability and the green transition, pinpoint current obstacles and possibilities, and offer policy suggestions that would promote sustainable economic growth in line with international sustainability norms. The paper will advance knowledge of how national policies can influence the Republic of Serbia's economy going forward in line with contemporary sustainability standards by analyzing the green transition's implementation and its effects on financial stability.*

**Key words:** green transition, financial stability, renewable source of energy, green finance

**JEL CLASSIFICATION:** G32, Q42, Q52, Q54.

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## 1. INTRODUCTION

The green transition is turning into a crucial economic strategy for nations all over the world in light of the deteriorating global climate changes and mounting demands on natural resources. It suggests a thorough process of moving away from conventional, high-carbon economic models and toward renewable and sustainable practices that take into account social, environmental, and energy factors. To attain long-term sustainability and lessen adverse effects on the environment, the green transition promotes innovation and modifications to public laws, consumer behavior, and production methods. As a developing country, the Republic of Serbia has to find a balance in this regard between financial stability, environmental responsibility, and economic progress. The ability of the financial system to endure shocks and operate effectively while supplying the resources required for economic growth is known as financial stability. Following global trends in the direction of sustainability, the importance of financial stability for the successful implementation of green policies is increasingly recognized. The difficulties of developing a sustainable financial framework to support green initiatives are made much more apparent in Serbia, where institutional capacities and economic resources are frequently constrained. Achieving a green transition requires both strengthening institutional capacities to manage conditions that support environmental goals and carefully integrating sustainable practices into the financial sector.

To analyze the opportunities and challenges that the green transition presents for the Republic of Serbia's financial stability, this paper examines at the results that have been attained thus far, the green financial instruments that have been issued, as well as the difficulties and potential outcomes in putting this strategy into practice. The research will also examine the role of financial institutions, present policies, and potential avenues for international collaboration in this area. By using this method, the paper seeks to offer precise insights and suggestions that may aid in the creation of a sustainable economic model that satisfies the demands of contemporary society and protects the environment.

## 2. LITERATURE REVIEW

The idea of the green transition is one of the key principles of modern economic and development initiatives worldwide. This process involves a shift away from conventional, carbon-intensive economic models and toward sustainable, environmentally acceptable alternatives, with a focus on energy efficiency, renewable energy sources, and mitigating the adverse environmental effects of economic activity. But even while the green transition has many long-term advantages for the economy and the environment, there are dangers and difficulties involved, particularly with regard to financial stability. In light of this, it is becoming more and more important to analyze how the green transition affects financial stability in both industrialized and developing countries, such as the Republic of Serbia. Adopting sustainable development policies can, on the one hand, promote innovation, draw in green investments, and lessen the financial uncertainty brought on by climate change. However, the shift to sustainable business models could result in major structural changes in the financial sector, including risks related to transition costs, volatility in the energy market, and possible issues with the financial sector's ability to adjust to new regulatory frameworks.

The objective of this literature review is to provide a theoretical and empirical framework for understanding the relationship between the green transition and financial stability, with a particular emphasis on the specificities of the Serbian economic and financial context. Financial stability is regarded as one of the fundamental pillars of any economic system, as it enables the economic and social framework to absorb shocks arising from inefficiencies inherent in the existing general economic setup<sup>1</sup>. Climate change represents a novel risk mechanism for the stability of the financial system. A significant number of financial institutions seek to assess their exposure to climate-related risks. Consequently, central banks and regulators have begun developing scenarios for climate stress testing to determine the potential impact of climate change on the economic sector<sup>2</sup>. The transition to a low-carbon economy will entail comprehensive transformations of the energy and economic systems<sup>3</sup>. The transition to a low-carbon economy is both a challenging and highly urgent task. To fulfill commitments under the Paris Agreement, it is essential to gradually phase out brown industries, which are the largest polluters, while

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<sup>1</sup> Abbas Jadoon, Mumtaz, Sheikh, Ayub and Tahir (2021), pp. 12

<sup>2</sup> Sun, Fang, Iqbal and Bilal, (2022), pp. 33071

<sup>3</sup> Daumas (2024), pp. 601

simultaneously establishing new green industries that will be more energy-efficient<sup>4</sup>. The increased occurrence of floods and wildfires are among the negative impacts of climate change that affect business operations, damage the value of real estate (both residential and commercial), and lead to a decline in property values. A significant component of financial risk lies in the uncertainty surrounding greenhouse gas emissions, responses to climate change, and the economic and financial implications of climate change<sup>5</sup>. Achieving climate goals requires ambitious climate policies and profound structural transformations across all economies worldwide. Any further delay in undertaking comprehensive and internationally coordinated climate actions will necessitate radical future interventions, increasing the macroeconomic costs of the low-carbon transition<sup>6</sup>.

In this regard, it is crucial to emphasize the need for further development of green finance. The 2015 Paris Agreement highlighted the importance of private investments in financing the transition to a low-carbon economy. Since then, conditions for increasing green investments have been analyzed, with a particular focus on the role of climate-aligned policies and financial regulations<sup>7</sup>. The analysis by Al Dhaheri and Nobanee<sup>8</sup> demonstrates the proven benefits of implementing green finance. Specifically, if ethical criteria drive companies to commit to using green finance instruments, this will positively impact their business performance. Companies that focus on financial stability tend to achieve better performance due to lower capital costs and higher profitability.

One of the key challenges of the green transition is ensuring energy security, which will require investments in infrastructure compatible with the era of renewable energy and electric mobility. Strengthening energy security in the renewable energy era necessitates strategic support for production capacities across different countries. Given that the higher initial costs of renewable energy are offset by lower operational expenses, it is estimated that energy systems based on renewable energy and their associated infrastructure have costs comparable to those of fossil fuel-based energy systems<sup>9</sup>. Energy efficiency focuses on the use of technology to achieve the same or higher

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<sup>4</sup> De Haas, Martin, Muûls and Schweiger, (2023), pp. 34

<sup>5</sup> Kirikkaleli and Sofuoglu, (2023), pp. 7

<sup>6</sup> Diluiso, Annicchiarico, Kalkuhl and Minx (2023), pp. 3

<sup>7</sup> Monasterolo, Mandel, Battiston, Mazzocchetti, Oppermann, Coony, Stretton, Stewart and Dunz (2022), pp. 6

<sup>8</sup> Al Dhaheri and Nobanee (2020), pp. 17

<sup>9</sup> Kim, Panton and Schwerhoff (2024), pp. 6

level of benefits while consuming less energy. Energy efficiency systems are among the most cost-effective and immediate solutions for reducing fossil fuel consumption and, consequently, lowering environmental pollution levels<sup>10</sup>.

### 3. RESEARCH METHODOLOGY

The research aims to analyze the impact of the green transition on financial stability in the Republic of Serbia, taking into account economic, environmental and institutional factors. In the paper, we will apply qualitative and quantitative research, with a focus on the case study of the Republic of Serbia. The collection and analysis of data is based on relevant sources such as the National Bank of Serbia, Statistical Office of the Republic of Serbia, the Public Debt Administration, but also from leading international organizations such as the European Bank for Reconstruction and Development, the European Environment Agency and Eurostat. The combination of qualitative and quantitative methods enables a comprehensive analysis, while the case study provides concrete insight into the situation in Serbia. The following are the main research questions (RQ):

RQ 1: How does financial stability get impacted by green transition?

RQ 2: Which green financial instruments support the green transition?

RQ 3: What are the biggest challenges and future perspectives of the green transition in the Republic of Serbia?

### 4. GREEN TRANSITION IN THE REPUBLIC OF SERBIA

Climate change represents one of the greatest challenges of our time and, as such, poses risks to all economic and social systems, including the financial sector<sup>11</sup>. Thus, climate change constitutes a formidable challenge that necessitates sustainability, comprehensive strategies, and costly solutions<sup>12</sup>. In the absence of sufficient mitigation measures, climate change may generate an increasing potential for adverse socio-economic impacts due to extreme weather conditions<sup>13</sup>. Given climate change and the increasingly pronounced consequences of environmental degradation, the global community faces the

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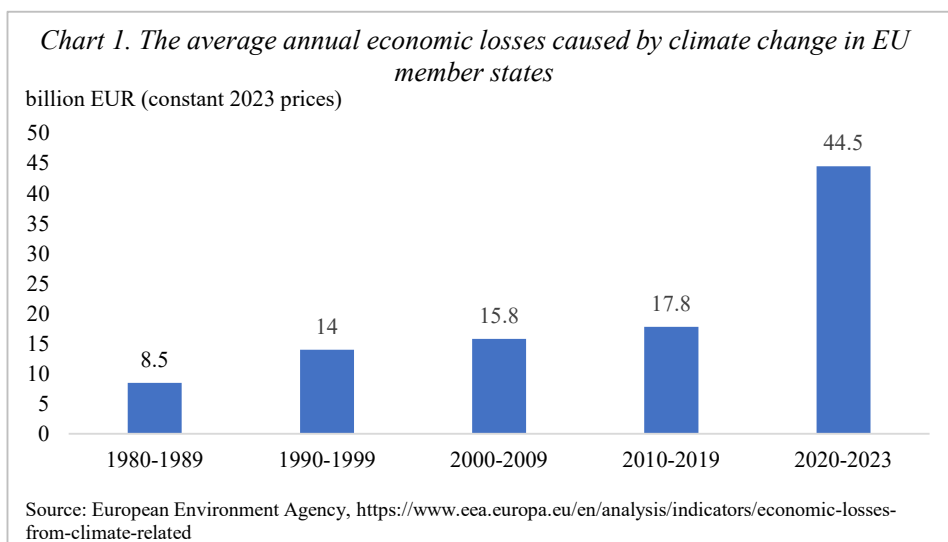
<sup>10</sup> Mičić and Šorgić (2024), pp. 161

<sup>11</sup> Zaharieva Kirova (2021), pp. 107

<sup>12</sup> Đuričin, Kuč and Vuksanović Herceg (2024), pp. 9

<sup>13</sup> Battiston, Dafermos and Monasterolo, (2020), pp. 2

challenge of transitioning to sustainable energy systems, characterized by the concept of the green transition. The green transition serves as both a means to mitigate existing structural imbalances and a platform for sustainable and inclusive growth, ensuring equal consideration for both people and nature<sup>14</sup>. This process entails a transition from traditional energy sources, such as fossil fuels, to renewable energy sources while integrating sustainability principles into economic and social practices. The goal of the green transition is not only to reduce carbon dioxide and other greenhouse gas emissions but also to promote economic growth that is resilient to environmental and climate-related risks. The implementation of the green transition concept is particularly important given the substantial losses resulting from climate change - Chart 1. The highest losses among European Union (EU) member states due to climate change were recorded in 2021 (EUR 63 billion), 2022 (EUR 56 billion), 2002 (EUR 45.7 billion), 2023 (EUR 43.9 billion), and 1999 (EUR 36.7 billion)<sup>15</sup>.



The green transition in the Republic of Serbia represents a process through which the economy, industry, and society as a whole are steered toward sustainable and environmentally friendly development. The primary objectives include reducing environmental impact, primarily by decreasing carbon dioxide emissions, improving energy efficiency, and transitioning to renewable energy sources. As a country in the process of European integration,

<sup>14</sup> Đuričin, Vuksanović Herceg and Kuč, (2023), pp. 3

<sup>15</sup> <https://www.eea.europa.eu/en/analysis/indicators/economic-losses-from-climate-related>

Serbia is obliged to adhere to international climate commitments, such as those outlined in the Paris Agreement, while also enhancing its national climate policies. This creates opportunities for greater use of green finance, investments in renewable energy sources, energy efficiency, and the development of new “green” industries. The challenges Serbia faces in this process include its dependence on carbon-based energy resources and the need for significant financial and technological investments. However, substantial potential lies in aligning economic growth with sustainable development, which can facilitate job creation, foster innovation, and improve environmental quality. The successful implementation of the green transition requires the collaboration of government institutions, the private sector, and international partners.

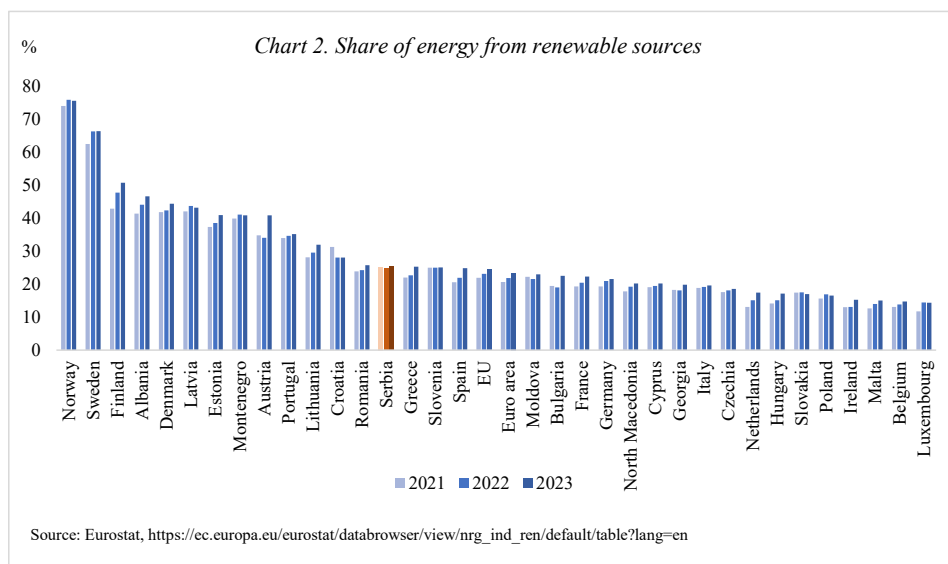
Research on the impact of climate change on the stability of the financial system is of great importance for the timely identification of climate-related risks. From the perspective of central banks, climate change can pose risks to the financial system, with two types being particularly significant. Physical risks refer to natural disasters caused by extreme weather events, which can negatively affect the financial stability of households, businesses, banks, and insurance companies, potentially leading to financial and macroeconomic instability. Transition risks arise from the tightening of regulatory policies on technological processes, which may require reductions in carbon dioxide emissions. This, in turn, can lead to an unplanned reassessment of the value of assets held by companies whose production processes emit carbon dioxide. The frequency and destructive effects of natural disasters induced by climate change are showing an upward trend. These challenges necessitate international cooperation, which is the primary objective of the Network for Greening the Financial System (NGFS), which represents a network of central banks and supervisors that, on a voluntary basis, better manage climate risks in the financial system.

According to the most recent available data, carbon dioxide (CO<sub>2</sub>) emissions in Republic of Serbia in 2022 increased by 1.3% compared to 2021 (from 51,476.6 kilotons to 52,152.3 kilotons). When analyzed by sectors of economic activity, the highest emissions were recorded in the Electricity, Gas, and Steam Supply sector (31,389.1 kilotons), followed by the Manufacturing sector (9,461.0 kilotons), Households (8,589.7 kilotons), and other sectors with 2,712.4 kilotons<sup>16</sup>. Therefore, it is essential to implement energy management, within which the increase in energy from renewable sources represents a key

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<sup>16</sup> <https://publikacije.stat.gov.rs/G2024/HtmlE/G20241257.html>

component of the sustainable development concept<sup>17</sup>. This is particularly important due to the increasing rise in temperatures during the summer months, leading to higher electricity consumption. In the Republic of Serbia, the majority of electricity (70%) is generated from thermal power plants, while the remaining 30% comes from sixteen hydropower plants. Thermal power plants primarily rely on coal, indicating that most of the electricity is derived from fossil fuels. According to data from Elektroprivreda Srbije (EPS), the largest electricity producer in Serbia, the country generated 1,806,631.76 MWh from renewable energy sources in 2023<sup>18</sup>, the most recent year for which data is available. The largest share of this production came from wind energy (57.2%), followed by hydropower (18.8%). With this level of production, Serbia managed to increase the share of renewable energy sources in total electricity generation to 25.4% in 2023 (24.7% in 2022), slightly above the share recorded in the EU (24.6%) and the Euro area (23.4%), but significantly below that of Norway (75.6%) and Sweden (66.4%), where electricity generation is predominantly based on renewable energy sources - Chart 2.



In order to increase the share of renewable energy sources, the Ministry of Mining and Energy has so far organized two auctions for the allocation of market premiums for renewable energy sources. The first auction, held in August 2023, attracted 16 investors with a total power plant capacity of 816.48

<sup>17</sup> Lukić and Molnar (2023), pp. 126

<sup>18</sup> <https://www.eps.rs/cir/Pages/tehnicki-izvestaji.aspx>

MW, of which 602.8 MW was offered to fill the quota. The estimated investment value of all power plants participating in the auction amounted to EUR 1.26 billion. The second auction, held in November 2024, set specific quotas for renewable energy sources: 300 MW for wind farms with an approved capacity of 3 MW or more and 124.8 MW for solar power plants with an approved capacity of 500 kW or more. Interested participants had until February 5, 2025, to submit their bids electronically via the “RES Portal – Auctions”. However, the results of this second auction have not yet been published.

According to data from the Association of Renewable Energy Sources of Serbia (RES Serbia)<sup>19</sup>, the total planned primary energy production from renewable sources in 2025 is projected to be 2.770 million tons of oil equivalent (Mtoe), which is 2% lower than the estimated production in 2024. Thermal power plants will continue to be the cornerstone of Serbia’s electricity system, producing over 62% of the total electricity, or 24,202 GWh. Energy Development Strategy of the Republic of Serbia until 2040, with projections extending to 2050<sup>20</sup>, stated that electricity production from renewable energy sources is expected to steadily increase. For 2030, the projected electricity production from renewable sources is 18,264 GWh, with the largest share coming from hydropower, which is expected to account for 59.3%. By 2040, this production is expected to increase to 33,331 GWh, with hydropower maintaining the largest share (projected at 37.9%), followed by solar energy with a share of 30.8%.

## **5. THE IMPACT OF THE GREEN TRANSITION ON THE FINANCIAL STABILITY OF SERBIA**

The implementation of a transition aimed at achieving a low-carbon economy may generate risks with potential implications for financial stability. Central banks have issued warnings that climate change risk could have destabilizing effects on financial stability, and the process of climate transition constitutes a source of systemic risk. Consequently, assessing the impact of climate change risks on the stability of the financial system is a high priority on the agenda of central banks, regulators, and investors<sup>21</sup>. Climate change reduces consumer spending and investor demand, subsequently decreasing

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<sup>19</sup> <https://oie.rs/energetski-bilans-srbije-za-2025-koriscenje-energije-vetra-raste-za-17-a-energije-sunca-za-3/>

<sup>20</sup> <https://mre.gov.rs/tekst/8334/-strategija-razvoja-energetike-republike-srbije-do-2040-godine-sa-projekcija-ma-do-2050-godine.php>

<sup>21</sup> Ojea-Ferreiro, Reboredo and Ugolini (2022), p. 3

household sector demand for corporate bonds. At the same time, demand for deposits and government securities increases, while overall productivity declines<sup>22</sup>. As a result, there is an increased awareness of the crucial role that central banks and financial supervisors play in allocating funds for sustainable investments in line with their mandate for price and financial stability, as well as in halting the financing of activities that harm the environment<sup>23</sup>.

Regarding the assessment of the impact of climate change on financial stability, the National Bank of Serbia has undertaken numerous activities to date. In July 2021, on the occasion of its 137<sup>th</sup> anniversary, the National Bank of Serbia became a member of the esteemed international network of central banks and supervisors within the Network for Greening the Financial System (NGFS). NGFS is one of the leading initiatives of financial institutions dedicated to the greening of the global financial system. According to the latest data as of December 10, 2024, NGFS comprises 142 members from over 90 countries and 21 observers, including the world's largest central banks and international financial institutions. In its Annual Financial Stability Report for 2020<sup>24</sup>, the National Bank of Serbia conducted an analysis of the banking sector's exposure to climate change in the Republic of Serbia. By applying a sectoral analysis, the National Bank of Serbia examined the level of credit indebtedness in relation to the amount of carbon dioxide emitted by each sector on an annual basis. The analysis revealed that the sectors in the Republic of Serbia with the highest carbon dioxide emissions are the electricity supply sector (0.14 kg/RSD), followed by the mining industry (0.02 kg/RSD) and the manufacturing industry (0.01 kg/RSD)<sup>25</sup>. To assess the exposure of the banking sector, it is essential to examine credit activity across different sectors. Although the electricity supply sector accounted for the largest share of total carbon dioxide emissions (52.2%), it had a relatively low share in the total loans of the banking sector (1.6%). Conversely, the situation differs for the mining and manufacturing industries, which accounted for 16.3% of total carbon dioxide emissions while holding a 13.5% share in the total loans of the banking sector. This analysis highlighted the sectors that may contribute to a high-risk credit portfolio at the banking sector level, given the necessity of implementing a green transition.

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<sup>22</sup> Dafermos, Nikolaidi and Galanis (2018), p. 229

<sup>23</sup> Tung Chan, Punzi and Zhao (2024), p. 14

<sup>24</sup> [https://www.nbs.rs/export/sites/NBS\\_site/documents-eng/publikacije/fsr/fsr\\_2020.pdf](https://www.nbs.rs/export/sites/NBS_site/documents-eng/publikacije/fsr/fsr_2020.pdf)

<sup>25</sup> Martin (2023), p. 317

In its Annual Financial Stability Report for 2023<sup>26</sup>, the National Bank of Serbia conducted, for the first time, a climate stress test, specifically a quantitative analysis of the impact of transition climate risks on the banking sector of the Republic of Serbia. The implementation of the climate stress test followed four phases. In the first phase, an assessment of the probability of corporate default was conducted. The second phase involved applying a sectoral carbon dioxide emission model using input-output tables. In the third phase, an analysis of financial performance indicators was incorporated into the corporate default probability model, assuming the realization of transition climate risk. Finally, the fourth phase applied a banking sector solvency stress test for transition climate risk. The analysis showed that the capital adequacy ratio at the level of the Serbian banking sector would be approximately 0.15 percentage points lower than in a scenario where transition climate risk does not materialize over a five-year horizon, with the largest individual decline amounting to 0.41 percentage points. It can be concluded that, even after the effects of transition climate risks, banks in Serbia would maintain a capital adequacy ratio above regulatory minimums and remain adequately capitalized. Consequently, the financial stability of the Republic of Serbia would not be threatened.

In July 2024, the National Bank of Serbia published an Analysis of Banks' Activities in the Area of Climate-Related Risks<sup>27</sup>, which indicated that banks operating in Serbia have already, to some extent, developed an approach to climate-related risks. This is particularly evident among banks that are part of groups whose ultimate parent company is headquartered outside Serbia. The recognition of climate-related risks is also reflected in the fact that half of the banks offer energy efficiency loans, while certain banks have established restrictions or prohibitions on lending to clients based on these risks. However, the majority of banks have not yet assessed the impact of climate-related risks on their risk profile and capital, nor have they introduced any form of green asset indicators. When it comes to challenges related to climate risks, banks primarily highlight issues such as the availability, reliability, comparability, and verifiability of data, as well as the level of employee expertise in this area.

To conclude, the green transition represents a significant challenge, but also an opportunity for preserving financial stability, especially in the context of the specific economic and financial characteristics of the Republic of Serbia. While transitioning to a low-carbon economy requires substantial investments

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<sup>26</sup> [https://www.nbs.rs/export/sites/NBS\\_site/documents-eng/publikacije/fs/fsr\\_2023.pdf](https://www.nbs.rs/export/sites/NBS_site/documents-eng/publikacije/fs/fsr_2023.pdf)

<sup>27</sup> [https://www.nbs.rs/sr\\_RS/scripts/showcontent/index.html?id=19886](https://www.nbs.rs/sr_RS/scripts/showcontent/index.html?id=19886)

and regulatory changes, it can, in the long run, contribute to energy security, sustainable economic growth, and the reduction of financial risks associated with climate change. The development of green finance and the integration of climate-aligned policies are crucial for ensuring a stable transition while maintaining financial stability. Further research and policy should focus on strengthening institutional capacities, encouraging private sector engagement, and creating a resilient financial framework to support sustainable development in Serbia.

## **6. FINANCIAL INSTRUMENTS TO SUPPORT THE GREEN TRANSITION IN SERBIA**

Green financial instruments are crucial in the context of the escalating global climate crisis because they offer the funding required for the creation and application of eco-friendly technologies, support initiatives that lessen their adverse effects on the environment, and help draw private investment for environmentally friendly projects<sup>28</sup>. According to the European Central Bank, the implementation of the green transition to achieve a climate-neutral economy represents a key challenge for the EU and necessitates substantial investments through 2030 and beyond. Estimates of the additional capital expenditures and durable consumption goods required to maintain low carbon dioxide emissions each year until the end of this decade range from 2.7% to 3.7% of the EU's gross domestic product, based on 2023 data. Delays in the implementation of decarbonization, particularly on a global scale, would further escalate the costs of transition and adaptation<sup>29</sup>.

The necessity of investing in green financial instruments is evident in the Republic of Serbia. To date, the Public Debt Administration within the Ministry of Finance has issued two green financial instruments: a green bond in September 2021 and a sustainability bond in June 2024. In mid-September 2021, the Republic of Serbia issued a green Eurobond on the international market in the amount of EUR 1.0 billion, with a maturity of seven years. This Eurobond was issued at the lowest recorded coupon rate of 1.00% and a yield rate of 1.26%, with investor demand exceeding EUR 3 billion during the auction. With this issuance, the Republic of Serbia became one of the few European countries—and at that time, the only European country outside the EU—to issue a green financial instrument. The funds raised were allocated

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<sup>28</sup> Krause, Myroshnychenko, Tiutiunyk and Latysh (2024), pp. 201

<sup>29</sup> [https://www.ecb.europa.eu/press/economic-bulletin/articles/2025/html/ecb.ebart202501\\_03~90ade39a4a.en.html](https://www.ecb.europa.eu/press/economic-bulletin/articles/2025/html/ecb.ebart202501_03~90ade39a4a.en.html)

following the Green Bond Framework and were used to finance or refinance new and existing expenditures aimed at fostering more sustainable economic growth. Investments were directed toward renewable energy, sustainable water management, energy efficiency, transportation, and pollution prevention and control. The issuance of the green bond fully adhered to the principles of the International Capital Market Association (ICMA), which represent the global standard in this domain. For this green bond issuance, the Republic of Serbia received the “Sovereign Green Market Pioneer in 2021” award from the Climate Bonds Initiative in June 2022.

In early June 2024, the Republic of Serbia successfully issued a ten-year U.S. dollar-denominated sustainability bond on the international financial market, with proceeds allocated to sustainable projects in the areas of the green agenda and socially responsible activities. This sustainability bond issuance amounted to USD 1.5 billion, with a coupon rate of 6.00%, while investor demand exceeded USD 6.5 billion. For the purpose of effective public debt management, the Republic of Serbia simultaneously executed a hedging transaction, immediately converting the obligation arising from the issuance of U.S. dollar-denominated sustainability Eurobonds into an obligation denominated in euros. This transaction not only mitigated foreign exchange risk associated with fluctuations between the U.S. dollar and the euro but also reduced Serbia’s borrowing costs. Following the execution of the cross-currency swap, the effective borrowing cost for the ten-year Eurobond stands at 4.754%.

In addition to the issuance of green financial instruments by the Republic of Serbia, several banks in Serbia offer green loans designed to finance projects that enhance energy efficiency and environmental protection. These loans are available to individuals, entrepreneurs, and businesses. *NLB Komercijalna Banka* offers several types of green loans: (1) green consumer loans, intended for individuals to purchase energy-efficient appliances and equipment, featuring a fixed interest rate and a repayment period of up to 71 months; (2) green housing loans, designed for purchasing energy-efficient real estate, with repayment terms ranging from 96 to 360 months and (3) green loans for sustainable business, which are special-purpose loans aimed at resource conservation, energy efficiency, and renewable energy sources, enabling the financing of projects that directly contribute to environmental sustainability. *Erste Bank* offers green housing loans intended for the purchase of energy-efficient properties. These loans can be granted either with a fixed interest rate and a repayment period of up to 240 months or with a variable

interest rate and a repayment period of up to 360 months. *ProCredit Bank* is committed to environmentally sustainable business practices and offers energy efficiency loans, which can provide clients with a refund of up to 20% of their investment. These loans are granted in cooperation with the EBRD and the Green Economy Financing Facilities (GEFF), which will be discussed further in the following sections. Citizens can use these loans to invest in energy-saving technologies, such as insulation, door and window replacements, heat pumps, and solar panels. All these banks aim to encourage investments in projects that promote environmental sustainability and energy efficiency, offering favorable financing conditions for such initiatives.

## **7. CASE STUDY: APPLICATION OF GREEN TRANSITION PROJECTS IN SERBIA**

We will present the implementation of green transition projects in the Republic of Serbia using data from the Green Economy Financing Facilities (GEFF), which supports businesses and individuals seeking to invest in green technologies and is funded by the EBRD. The GEFF program is not merely a financial instrument; rather, an experienced team of banks and technical program managers from the EBRD ensures quality and innovation in the services provided by GEFF. In addition to financing, advisory services are available to assist financial institutions and their clients in efficiently adopting best market practices. GEFF programs operate in 29 countries through more than 191 local financial institutions. The implementation of GEFF programs has enabled over 231,000 clients to reduce carbon dioxide emissions by more than 10 million tons annually.

The GEFF program in the Western Balkan countries, including the Republic of Serbia, was launched in 2017. Since then, more than 18,000 households in the region have invested over EUR 100 million to improve energy efficiency. These investments have primarily been directed toward programs aimed at enhancing home insulation, installing heat pumps, replacing windows and doors, and integrating solar panels. As a result, these initiatives have led to a reduction in carbon dioxide emissions by over 25,000 tons annually and an annual energy savings of 70,000 MWh. The initial GEFF budget for the Western Balkans has increased from EUR 135 million to €415 million, with further expansions planned.

Table 1 presents GEFF projects in the Republic of Serbia, specifically those related to the corporate sector. Other GEFF investments in Serbia include Energy Service Companies (ESCs), households, the public sector, small

and medium-sized enterprises, as well as suppliers and manufacturers. The corporate sector was selected for analysis as it represents the sector that has received the highest level of GEF investment. The results of these investments indicate significant energy savings and a reduction in carbon dioxide emissions. This is particularly important as it contributes to mitigating the effects of climate change in the Republic of Serbia, considering that carbon dioxide is a major contributor to global warming. Consequently, global warming leads to extreme weather events such as glacier melting and rising ocean and sea levels. Additionally, temperature increases alter plant and animal biodiversity, endangering the survival of many species. Reducing fossil fuel consumption also lowers health risks, particularly respiratory and cardiovascular diseases. Furthermore, increased investment in renewable energy sources contributes to energy neutrality and, consequently, long-term sustainability. Finally, greater investment in green technologies fosters job creation and helps prevent economic losses that may arise from climate-related disasters such as wildfires, floods, and droughts. All these factors contribute to creating a healthier planet for future generations, ensuring a sustainable future for all.

*Table 1. Green Economy Financing Facilities in Serbia through GEF Facilities (Corporate sector)*

Investor	Investment	Investment Size	Financial results	Energy savings	CO2 savings	Donor
Eminent Ltd., a clothing manufacturer	Replacement of old machines for garment washing, drying and spraying	EUR 239,100	Payback period of 6.6 years; cost savings of EUR 36,406 per year	966 MWh per year	226 tonnes of CO <sub>2</sub> emissions per year (64%)	EU
ExpressTrans	5 trucks	EUR 474,000	Pay back period of 4 years	650 MWh per year	164 tons per year	EU, WBIF
FMB	Plastic moulding machines	EUR 370,800	Pay back period of 4 years	1,300 MWh per year	Investment leads to sufficient energy savings and reduction of CO <sub>2</sub> emissions.	EU, WBIF
DIV Trades	Processing equipment	EUR 706,500	Pay back period of 4 years	3,117 MWh per year	1 tonne per year	EU, WBIF
Deltaplast d.o.o.	Die cutting machine and automated stacking machine	EUR 370,000 (loan of EUR 250,000)	Payback period of 5 years	95 MWh per annum	93% decline in CO <sub>2</sub> emissions each year	EU, WBIF
Eminent Ltd., a clothing manufacturer	Washing machines, driers and a textile spray cabin	EUR 239,100	Payback period of about 6 years	966 MWh per annum	Investment leads to sufficient energy savings and reduction of CO <sub>2</sub> emissions.	EU, WBIF
Farmer	Combine harvester	EUR 210,000	Pay back period of 7 years	42 MWh per annum	11 tonnes per annum	EU, WBIF
Impol Seval d.o.o.	Replacement of two energy-intensive blast furnaces	EUR 2,608,752	Monetary savings of EUR 724,828	19,072 MWh per year	3,396 tonnes per year	EU, WBIF
Knjaz Miloš AD Arandelovac	Juice treatment and carbonization unit	EUR 594,000	Savings of €17,000 annually	75 MWh per year	56 tonnes CO <sub>2</sub> per year	Green Climate Fund, Government of Luxemburg
Crvenka fabrika secera AD	Various energy efficiency measures	EUR 2,538,000	EUR 299,185 of the WeBSEFF financial incentive (15% of the total loan)	110,848 MWh per year	24,407 tonnes CO <sub>2</sub> per year	EU, WBIF

Note: EU - European Union, WBIF - Western Balkans Investment Framework  
Source: GEF

## 8. CHALLENGES AND FUTURE PERSPECTIVES

The transition to a green economy in the Republic of Serbia faces several significant challenges, which can be categorized as economic, regulatory, technological, and social. One of the primary challenges of the green transition is the *economic aspect*, specifically the high initial investments required for renewable energy projects, improvements in energy efficiency, and the sustainable development of infrastructure. As a developing economy, Serbia must secure these investments while simultaneously maintaining fiscal stability. Moreover, the domestic financial market remains underdeveloped in terms of issuing green financial instruments. Additionally, Serbia relies heavily on fossil fuels, particularly coal, for electricity generation, making the transition to renewable energy sources highly capital-intensive and structurally demanding. This shift may lead to economic disruptions, particularly in coal-dependent regions. The *regulatory framework* for the green transition is evolving, and Serbia has made some progress in aligning its environmental policies with EU regulations as part of the accession process. However, further improvements are necessary to establish a comprehensive and enforceable legal framework that facilitates the green transition. A third major challenge is related to *technology*, as the adoption of green transition principles requires the implementation of advanced technologies for renewable energy production, energy efficiency, and sustainable industrial processes. However, Serbia faces technological readiness challenges, including a lack of domestic production capacity for renewable energy equipment and insufficient investments in research and development. In this regard, modernizing the electricity transmission and distribution network is essential to ensuring stability and efficiency in an energy system with a high share of renewables. The *social challenge* is particularly evident in regions dominated by the fossil fuel industry. Job losses in coal mining and thermal power plants could lead to economic and social instability unless adequate workforce retraining and transition policies are implemented.

Despite the challenges, Serbia has significant opportunities to accelerate its green transition while ensuring financial stability. These opportunities arise from domestic policy initiatives as well as international financial and technical support. It is essential to strengthen green financing mechanisms by developing the domestic green bond market and increasing the number of banks offering green loans. Additionally, the implementation of public-private partnerships (PPPs) could play a key role in financing large-scale green infrastructure projects. Another opportunity for enhancing the green transition in Serbia lies

in phasing out fossil fuel subsidies and redirecting these funds toward programs that promote renewable energy sources. Furthermore, continuous efforts must be made to modernize energy infrastructure, including investments in smart grids, digital energy management systems, and battery storage solutions, to enable the faster integration of renewable energy into the national electricity system. Finally, Serbia should develop workforce retraining and employment programs in the renewable energy sector to ensure a smooth transition for workers previously employed in the fossil fuel industry.

While Serbia faces numerous challenges in its green transition, it is essential to implement proactive policies, financial innovations, and investments in sustainable infrastructure to successfully carry out the transition while maintaining financial stability. These efforts will be crucial in ensuring both environmental sustainability and financial stability.

## **9. CONCLUSION REMARK**

The green transition, as a process of transition to a sustainable and low-emission economy, represents one of the key challenges of modern society, which requires a balance between environmental goals and economic sustainability. The case study of the Republic of Serbia indicates that, although there is a growing awareness of the need for a green transition, its success largely depends on the country's financial stability and capacity to mobilize appropriate resources. Serbia, as a developing country, faces numerous challenges in the implementation of the green transition, including high initial costs and the need to strengthen the institutional framework.

One of the key findings of this paper is that financial stability plays a crucial role in enabling the green transition. Without adequate financial mechanisms, countries like Serbia will have a hard time achieving the ambitious goals of reducing greenhouse gas emissions and transitioning to renewable sources of energy. In this context, it is necessary to ensure access to international funds, as well as to develop domestic financial instruments, including green bonds and incentives for investments in sustainable projects. Also, it is important to emphasize the role of public-private partnership in capital mobilization for green initiatives. The paper also suggests that the green transition can have positive economic effects in the long term, including creating new jobs, developing innovative technologies and reducing dependence on imported energy. However, the short-term economic and social costs of the transition, such as industry restructuring and energy price increases, may pose

a challenge to financial stability, especially in countries with limited fiscal space. It is therefore crucial to ensure proper planning and a focus on social inclusion to avoid inequalities and ensure the support of the wider population.

In conclusion, the green transition in the Republic of Serbia requires a holistic approach that includes the strengthening of financial mechanisms, the adoption of innovative policies and cooperation with international partners. Without adequate support and strategic planning, the risk of destabilizing the financial system and slowing economic growth can be significant. Therefore, the green transition must not only be understood as an ecological imperative, but also as an economic opportunity that can contribute to the country's long-term prosperity and stability.

## **ZELENA TRANZICIJA I FINANSIJSKA STABILNOST: STUDIJA SLUČAJA REPUBLIKE SRBIJE**

### **Rezime**

*U okviru globalnih napora za očuvanje životne sredine i održivi ekonomski razvoj koncept zelene tranzicije postaje sve važniji. U tom kontekstu, Republika Srbija se suočava s izazovima i prilikama koje ova tranzicija donosi, posebno u oblasti finansijske stabilnosti. Zelena tranzicija podrazumeva prelazak sa tradicionalnih, fosilnih izvora energije na obnovljive izvore, kao i implementaciju politika koje promovišu održivu proizvodnju i potrošnju. Ova transformacija može značajno uticati na ekonomsku strukturu zemlje, stavljajući pritisak na postojeće finansijske institucije i tržišta. Finansijska stabilnost, s druge strane, predstavlja ključni aspekt svakog ekonomskog sistema, osiguravajući kontinuitet ekonomske aktivnosti i zaštitu od različitih vrsta rizika. Cilj rada je da istraži međusobne veze između zelene tranzicije i finansijske stabilnosti, identifikuje postojeće izazove i mogućnosti, kao i da pruži preporuke za politiku koja će omogućiti održiv ekonomski rast u skladu s globalnim standardima održivosti. Kroz analizu primene zelene tranzicije i njene implikacije na finansijsku stabilnost ovaj rad će doprineti dubljem razumevanju kako nacionalne politike mogu oblikovati budućnost ekonomije Republike Srbije u skladu sa savremenim zahtevima održivosti.*

**Ključne reči:** zelena tranzicija, finansijska stabilnost, obnovljivi izvori energije, zelene finansije

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