ECONOMIC GROWTH AND GREEN FINANCE PATH FOR SUSTAINABLE RURAL DEVELOPMENT IN ROMANIA

Raluca Ioana Stănciulescu[1], Manuela Georgiana Cioacă[2], Cosmin Dănuț Vezeteu[3]

Abstract

Rural development is facing a series of barriers, one of the most important being the insufficient level of private investment. Economic growth (EG) and Green finance (GF) represent opportunities to fill this investment gap in sustainable rural development. The main objective of this paper is to determine and analyze the potential of EG and GF as mechanisms to address emerging issues in Romania, such as economic resilience and adaptation in rural development. A comprehensive literature review, supplemented by a quantitative analysis of the key socio-economic indicators, is performed. This research identifies areas for improvement in policy frameworks for scaling up GF. The integration of GF with EG has many advantages, which could significantly advance sustainable rural development. GF and EG may have positive effects on sustainable rural development in Romania, including reducing regional development disparities, increasing economic resilience, enhancing climate change adaptation, and improving the capacity to respond to unexpected events. In addition, GF helps to diversify the national economy through more efficient use of resources, strengthened social inclusion and equity, and ensures the long-term sustainability of rural initiatives.

Key words: Green finance, economic growth, rural development, sustainability, regional disparity.

JEL[4]: Q01, Q56, R11

1 Raluca Ioana Stănciulescu, Ph.D. Student, Bucharest University of Economic Studies, Piata Romana no. 6, Bucharest, Romania, Phone: +407 431 266 73, E-mail: stanciulescuraluca16@stud.ase.ro, ORCID: 0009-0006-0720-2168 (corresponding author)

2 Manuela Georgiana Cioacă, Ph.D. Student, Bucharest University of Economic Studies, Piata Romana no. 6, Bucharest, Romania, Phone: +407 335 611 66, E-mail: manuela.cioaca@fin.ase.ro, ORCID: 0009-0000-3759-3602

3 Cosmin Dănuț Vezeteu, Ph.D., Bucharest University of Economic Studies, Piata Romana no. 6, Bucharest, Romania, Phone: +407 636 880 50, E-mail: cosmin.vezeteu@csie.ase.ro, ORCID: 0009-0007-7028-2786

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Introduction

The concept of Green finance (GF) has recently gained popularity as a key factor in the field of sustainable development. GF includes all financial activities and services that can facilitate the flow of capital to projects and initiatives with a positive impact on the environment (Bracking, Leffel, 2021). The concept is fundamentally linked to sustainable development, aiming to address ecological challenges through innovative financial tools that support green initiatives, such as green bonds, designed to mitigate climate change and diminish environmental deterioration (Zheng et al., 2021).

Over the last decade, the European Union (EU) has been undergoing a major environmental transition, shifting from a society largely dependent on fossil fuels to one strongly focused on social and environmental responsibility. To achieve the ambitious goal of climate neutrality by 2050, measures have already been taken since 2018 (Backstrand, 2022).

The most important measure implemented at the EU level is the Action Plan on Financing Sustainable Growth, launched in 2018. This initiative has been necessary despite a relatively high level of awareness regarding the need to reduce pollution, both at governmental level and among the population. However, effective implementation of appropriate measures remains challenging. One explanation lies in the diverse legislative frameworks across member states, shaped by the specificities of each country, and the difficulty of modifying existing regulations to support this transition (Tutak, 2020; Marecki et al., 2022).

In Romania, transition towards sustainable rural development requires a complex approach, focused on modernizing agricultural practices by integrating alternative financing mechanisms. Rural areas and agricultural sector have considerable potential to increase productivity, especially when traditional methods are complemented by GF initiatives (Florea et al., 2021). At the same time, available literature emphasizes that effective GF policies can significantly contribute to reducing carbon emissions from agriculture, facilitating the transition towards sustainable agricultural practices (Guo et al., 2022).

As the Romania has been fully integrated into the European policy framework, aligning national agricultural policies with EU, sustainability objectives become essential. The EU is emerging as a proponent of forms of financing that not only stimulate economic growth, but also prioritize environmental conservation (Stanciu et al., 2019). In achieving the Sustainable Development Goals (SDGs), rural areas must be recognized as key components, particularly in assessing progress toward rural sustainability. The SDGs comprise 17 interconnected global objectives

instituted by the United Nations (UN) in 2015. They are aiming to address critical problems such as poverty, inequality, climate change, and environmental degradation by 2030. It should be made clear that, while adapting the SDGs to the rural dimension is essential, this must be done without losing global comparability. Recent studies highlight the potential of GF in contributing to boost the economic growth and promote ecological balance through innovative financial mechanisms specially designed to enhance both productivity and sustainability in the rural areas (Nie et al., 2024; Ma et al., 2024).

Meanwhile, sustainable rural development depends on limited available resources, while it requires a comprehensive understanding of relationships between various socio-economic indicators. This understanding enables rural policies to be tailored upon the specific needs of different regions. This study analyses the relationship between EG and GF in achieving sustainable rural development in Romania.

Literature Review

The relationship among economic growth (EG), green finance (GF), and sustainable rural development is receiving significant focus in contemporary discussions about global sustainability. Rural communities' role in utilizing natural resources and services underlines the relationship between these elements, emphasizing how sustainable practices are crucial for maintaining ecological balance and long-term economic viability (Milićević et al., 2024).

The difference between GF and sustainable finance lies in the scope of resource allocation. GF is an instrument for mitigating climate change by directing public and private funds toward projects that add value to the environment, while sustainable finance targets investment projects that address environmental, social, and governance (ESG) concerns (Azhgaliyeva, Liddle, 2020). Improved access to GF empowers local communities and encourages investment in essential technologies and infrastructure, ensuring that the advantages of development are allocated equitably (Wang et al., 2022).

The global impact of GF has been increasingly recognized as essential for both environmental preservation and sustainable EG. GF has emerged as a key element for integrating environmental concerns into business strategies and for promoting both public and private participation in sustainable practices (Xue et al., 2023). In the case of Romania, the country is at crossroads in terms of its rural development policies and integration of sustainable practices. Romania's rural areas are characterized by a significant potential for EG through tourism, in particular agro-tourism, which capitalizes on local resources and cultural heritage (Adamov et al., 2020). However,

challenges remain significant, as rural areas suffer from inadequate infrastructure and limited access to GF mechanisms (Lazarova et al., 2023).

Moreover, Romania is internationally recognized as a country with significant opportunities for utilizing alternative energy sources due to its strategic geographic position and favorable climate. The sustainable development strategy for Romania, especially in rural areas, depends on the complex integration of economic growth mechanisms and GF initiatives. Some literature sources from the past decade emphasize the crucial role of sustainable economic policies aligned with environmental requirements.

Ibinceanu et al. (2021) delineate the factors influencing Romania's economic prosperity and long-term growth, advocating regional development strategies that support various indicators of sustainability. Their findings suggest that without a robust policy framework that promotes sustainability, regional disparities will worsen, thereby hindering comprehensive EG. Furthermore, Tamasila et al. (2023) highlight Romania's potential in achieving the SDGs by examining market trends that showcase a synergistic relationship between business performance and sustainable practices. Mentioned authors argue that business environments aligned with GF initiatives can catalyze rural development, providing a pathway to achieve national objectives within the 2030 Agenda. GF, when effectively implemented, has been shown to enhance local capacity for sustainable development, thereby supporting the 2030 Agenda objectives such as No Poverty (SDG 1) and Climate Action (SDG 13), also promoting rural revitalization initiatives (Lingmin, 2024).

Pauceanu and Sahli (2016) emphasize the necessity of policy frameworks that bolster rural economies through targeted investment in sectors such as tourism and agriculture. Improved access to GF empowers local communities and encourages investment in essential technologies and infrastructure, ensuring that the advantages of development are allocated equitably (Wang et al., 2022). This assertion resonates with Iacobuta et al. (2020), who argue that sustainable economic growth in Romania must intertwine social, economic, and environmental factors. Mentioned study highlights the importance of innovation opportunities and effective coordination of regional policies in supporting efforts to revitalize the rural economy. In this context, these initiatives can be considered an integral part of sustainable development objectives.

In a comparative analysis, Wu (2023) investigates the role of regional innovation as a driver of sustainable development in Romania. The study reveals that effective government support, particularly in financing innovation initiatives, is imperative for fostering rural economic growth. This finding resonates with Kandzija et al. (2020),

who underscores the importance of introducing innovative, knowledge-based practices in agriculture in order to facilitate the transition from traditional family farms to competitive entities capable for driving economic growth.

The influence of financial systems on rural sustainability cannot be overlooked. Nica et al. (2023) explore the implications of financial contagion on human well-being and economic growth, emphasizing the necessity for robust financial institutions that can manage risks while promoting sustainable practices. This need for resilience is overlapping in the findings of Ionescu et al. (2023), who consider the financial landscape of Romania's banking sector crucial for sustainable growth, especially in rural areas requiring significant investment and risk management appliance.

GF has gained momentum as an essential element of sustainable development. For example, Badircea et al. (2020) discuss how green taxes can serve as a double mechanism to promote environmental performance and EG in Romania. This captures the essence of the theory of the "double dividend", arguing that environmentally conscious policies can stimulate economic activity and promote ecological health at the same time.

In addition, creation of environmental tax policies, as shown by Radulescu et al. (2017), suggests that financing mechanisms could effectively mitigate the negative impact of EG on environmental sustainability. This favorably positioned Romania in a broader European context, where strategic environmental policies are the cornerstone. Xu et al. (2023), within the framework of green growth, have been investigated the effects of GF. They found that GF have a key role in creating added value in the industrial and agri-food sector. In recent years, there has also been a significant expansion in the literature addressing the relationship between green bonds and sustainable development, or highlighting the crucial role that sustainable finance can play as a key tool in mitigating climate change and supporting the transition to a zero-carbon economy.

Green bonds are structured similarly to traditional bonds but include an additional "use of proceeds" clause, which stipulates that funds must be exclusively allocated to environmentally beneficial projects, such as renewable energy, water management, and energy efficiency initiatives (Bhutta et al., 2022; Dwivedy, Sharma, 2023). This intrinsic feature makes them as vital instruments for financing projects that contribute to the United Nations SDGs and the objectives of the Paris Agreement (Tolliver et al., 2019; Sinha et al., 2021). In this context, it is essential to investigate the evolution of the green bond market, as it is widely described within the literature as a critical step toward aligning capital markets with sustainability imperatives (Maltais, Nykvist, 2020; Adisa et al., 2024).

Mihai et al. (2021) provide a comprehensive overview of the conceptual and practical barriers Romania faces in transitioning toward a green economy. The authors highlight the importance of aligning financial instruments, such as green bonds, with coherent sustainability strategies to ensure that the benefits of green economic policies extend beyond urban centers and contribute to balanced regional development.

Recent research by Nita et al. (2025) reinforces the idea that GF instruments, including green bonds, can act as catalysts for sustainable economic development. When embedded in a coherent policy framework, these tools not only contribute to macroeconomic stability but also enhance the impact of rural development initiatives through environmentally aligned investments.

In examining the interconnectedness of various factors, available literature sources reveal a consensus on the critical need for a strategic framework that combines economic, environmental, and social objectives to facilitate sustainable rural development in Romania. As highlighted in prior studies, mobilizing resources toward education and innovation in rural economies can significantly enhance their adaptive capacities and lead to sustainable prosperity.

Thus, achieving sustainable rural development in Romania demands a multifaceted approach that incorporates EG strategies alongside GF initiatives. Academic literature collectively suggests that through innovative policies, robust financial systems, and environmentally conscious practices, Romania can pave the way toward a sustainable economic future for its rural communities. Based on existing literature, following hypotheses are formulated:

H1: Sustainable financing initiatives focused on rural areas have a positive correlation with EG.

H2: GF investments positively impact sustainable rural development in Romania.

Methodology

To carry out the research, a comprehensive methodological framework was employed to thoroughly analyze the link between EG, GF mechanisms, and their impact on sustainable rural development in Romania, with particular focus on the period 2020-2024.

To provide an overview, a quantitative analysis based on descriptive statistics, correlation analysis and data visualization methods is employed, focusing on the temporal evolution of three main socio-economic indicators:

- Subnational Human Development Index (SHDI): Chosen as the primary indicator of rural development due to its multidimensional nature, encompassing health, education, and living standards. Moreover, considering the importance of understanding regional disparities and their influence on national development, the SHDI enables an assessment of the temporal dynamics of rural development across Romania's counties. Data was retrieved from the Subnational Human Development Database (Smits, Permanyer, 2019). Eurostat data is also used to supplement potentially limited data from analyzed period and to determine the degree of ruralization for each observed region.
- Persons at risk of poverty or social exclusion: This indicator was selected to explore Romania's social and economic challenges comparing to other EU Member States. It provides valuable insights into poverty and social exclusion, which are significant obstacles to sustainable rural development. Analyzing how these risks vary across different groups helps reveal specific vulnerabilities and inequalities within rural communities. Data was collected from the Eurostat website.
- Green bond issuances and sustainable financing initiatives: This indicator facilitates a more nuanced understanding of how green investments are directed toward rural areas and their subsequent impact on SHDI. It enables an assessment of the effectiveness of green finance in promoting rural sustainability. The data used for analyzing the evolution of the green bond market in Romania were obtained from LSEG, worldwide provider of financial data.

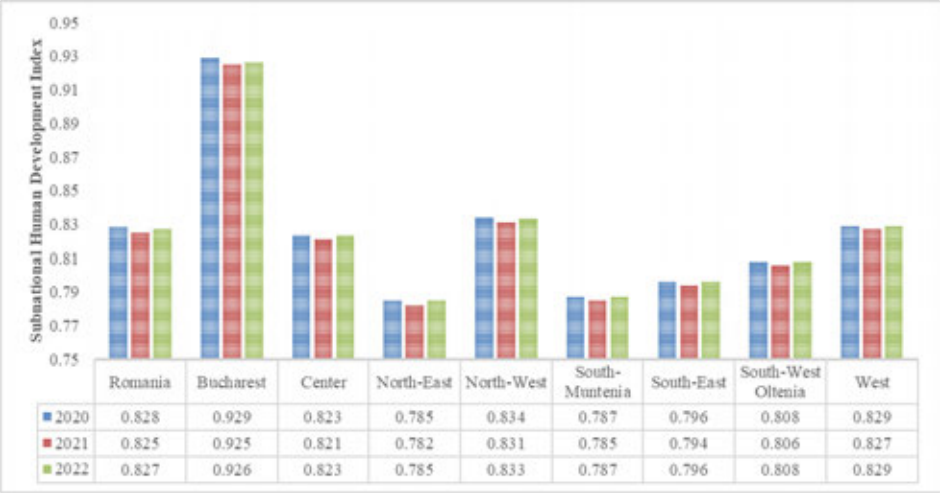
The temporal trends were examined to identify significant challenges and potential opportunities for GF in mitigating socio-economic inequality at the regional level. The study provides an analysis across Romania's NUTS 2 regions to emphasize discrepancies, as well as potential correlations among the chosen socio-economic indicators.

Results and Discussion

Analysis of SHDI trends in Romania

According to the Subnational Human Development Database's definitions, the SHDI is a composite index that measures average outcomes in three basic dimensions of human development: health based on life expectancy, educational attainment, and standard of living based on Gross National Income per capita. Given the limited data availability for this indicator (only up until 2022), additional relevant data was retrieved from the Eurostat website for 2023 and 2024, with the goal of identifying the regional differences and trends throughout the entire analyzed period.

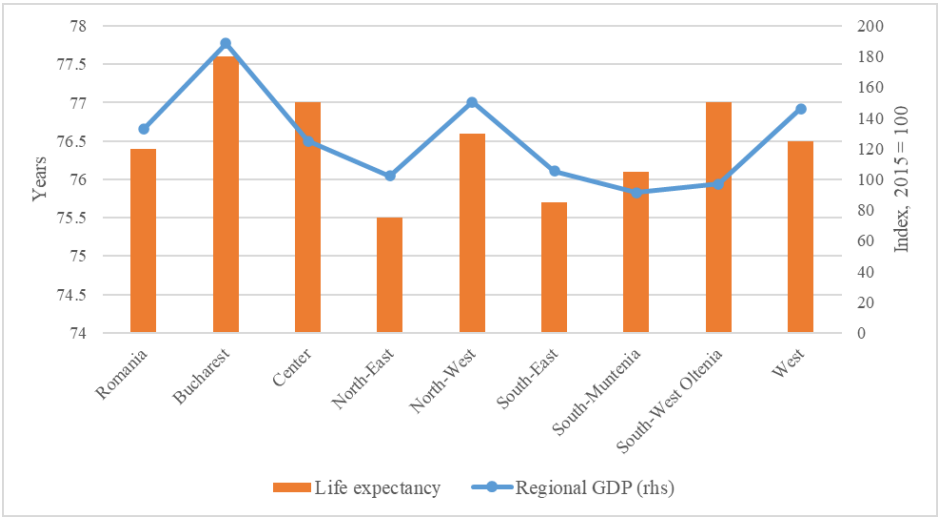
Figure 1. Evolution of Subnational Human Development Index (SHDI) for Romania's NUTS 2 regions, period 2020-2022.



	Romania	Bucharest	Center	North-East	North-West	South-Muntenia	South-East	South-West Oltenia	West
2020	0.828	0.929	0.823	0.785	0.834	0.787	0.796	0.808	0.829
2021	0.825	0.925	0.821	0.782	0.831	0.785	0.794	0.806	0.827
2022	0.827	0.926	0.823	0.785	0.833	0.787	0.796	0.808	0.829

Source: Authors' calculations based on Subnational Human Development Database (Smits, Permanyer, 2019).

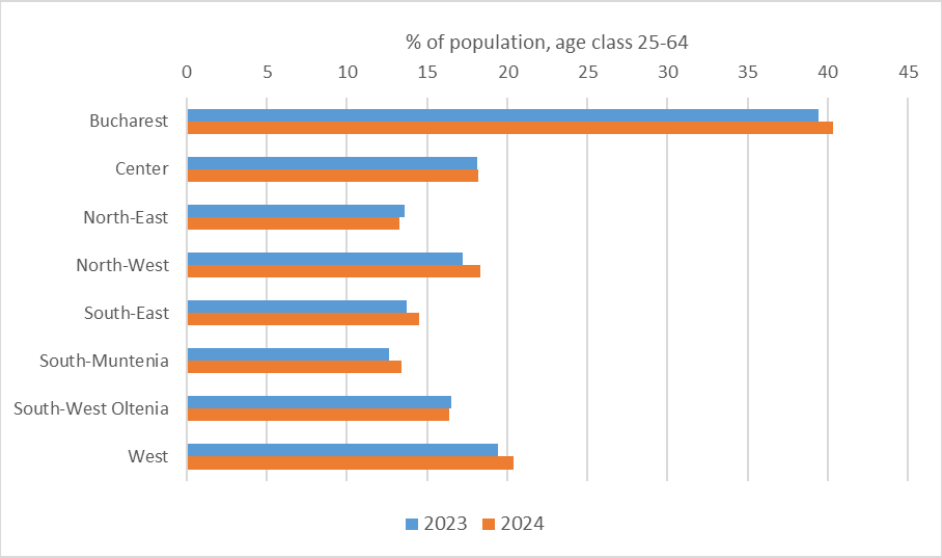
Figure 2. Regional GDP and life expectancy in 2023. for Romania's NUTS 2 regions



Source: Authors' calculations based on Eurostat (2025a) data.

Figure above (Figure 1.) shows the evolution of the main indicator at regional level for the period 2020-2022, while Figure 2. and Figure 3. highlight the structure of the basic dimensions of human development in Romania's regions in 2023 and 2024.

Figure 3. Tertiary education attainment in 2023. and 2024., age group 25-64, for Romania's NUTS 2 regions



Source: Authors' calculations based on Eurostat (2025d) data.

Figure 1. shows a generally stable trend in human development in Romania's main regions, with minor fluctuations in SHDI values between 2020. and 2022. A deeper analysis reveals, however, a few key takeaways.

With values above 0.92 in each of the observed three years, Bucharest continuously has the highest SHDI. Compared to other regions, this reflects its robust financial performance, higher earnings, better quality of education, and better healthcare services. In 2020., the Bucharest region had the highest SHDI (0.929), reflecting its advanced human development indicators.

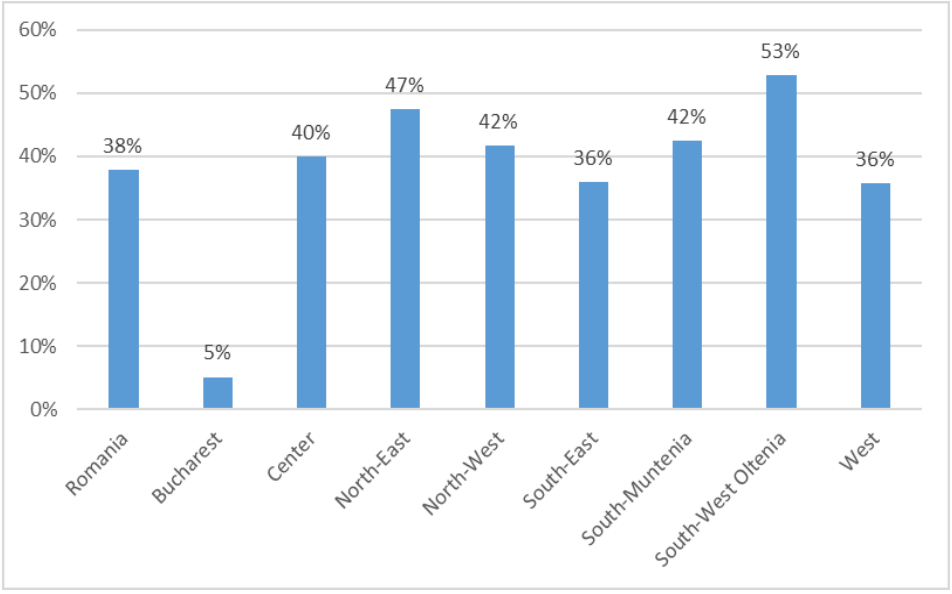
However, there is a clear difference between the more developed western and central regions (North-West, West, and Centre) and the less developed eastern and southern regions (North-East, South, and South-East). North-West and West regions maintain relatively high SHDI values (above 0.82), benefiting from industrial development, infrastructure, and investments. North-East and South have the lowest SHDI values (around 0.78), highlighting ongoing socioeconomic challenges, including lower income levels and limited access to quality healthcare and education. These aspects are also visible in the most recent data regarding economic growth, education and health. As is shown in Figure 2., western and central regions, along with Bucharest, benefit from a much higher regional GDP and life expectancy compared to the eastern and southern regions. Moreover, as highlighted in Figure 3., in the western

and central regions, the share of population with tertiary education is also higher than in eastern or southern regions, indicating a concentration of well-skilled population in these areas.

In most regions, the economic and social effects of the COVID-19 pandemic may have slightly reduced the SHDI in 2021. This decline can be attributed to disturbances in education, health care and economic activity. However, in 2022., the most of regions have been slightly recovered, indicating a return to pre-pandemic development level. Despite minor fluctuations, the SHDI scores in all regions have remained relatively stable over the observed three years. This indicates that Romania's human development progress is resilient, although regional inequalities remain as a problem.

An important aspect to be examined is the rural-urban composition of the analyzed regions and its correlation to human development. Figure 4. presents, for each of the analyzed regions, its degree of ruralization in 2024., i.e. the share of households in rural areas compared to the total number of households in the region.

Figure 4. Percentage of households in rural areas, by Romania's NUTS 2 regions, in 2024.



Source: Authors' calculations based on Eurostat (2025b) data.

Figure 4. shows that the regions with the highest share of rural areas are located in North-East, South-West Oltenia, and North-West. To explore the relationship between the degree of ruralization and human development, a correlation matrix is calculated (between the latest available human development indicators).

Table 1. Correlation matrix between the degree of ruralization and indicators of human development (use of the latest available data)

Element	Degree of ruralization	SHDI	Regional GDP	Life expectancy	Tertiary education attainment
Degree of ruralization	1.0	-	-	-	-
SHDI	**-0.88**	1.0	-	-	-
Regional GDP	**-0.82**	0.92	1.0	-	-
Life expectancy	**-0.52**	0.82	0.66	1.0	-
Tertiary education attainment	**-0.92**	0.98	0.88	0.76	1.0

Source: Authors' own calculations based on Subnational Human Development Database and Eurostat data.

Based on the results from Table 1., there is a generally strong negative relation between the degree of ruralization and the indicators of human development at regional level in Romania. As an exception, the correlation coefficient between life expectancy and the degree of ruralization shows a rather moderate, but still negative link.

Romania's SHDI data highlight the current differences between regions, with Bucharest and the central-western regions clearly ranked on the top compared to worst ranked eastern and southern regions. These differences underline the necessity of targeted action through GF mechanisms, which can support the development of environmentally responsible infrastructure and investments, especially in the laggard regions, with predominantly rural households, compared to the other urban-dominant regions. Romania could promote inclusive growth, decrease territorial inequality, and support the long-term goals of sustainable development in accordance with the Agenda 2030 framework by coordinating green financing routes with rural development programs.

The evolution of persons at risk of poverty or social exclusion

Table 2. presents the share of population aged 18 and older who are at the risk of poverty or social exclusion across EU-27 countries within the period 2020-2024. Data reveals significant variations across countries and established trends over time.

Table 2. Persons at risk of poverty or social exclusion by countries of EU-27 (population aged 18 and older), period 2020-2024.

Country	Persons at risk of poverty or social exclusion (in %)					Year to year change, in pp*					Rank				
	2020	2021	2022	2023	2024	21/20	22/21	23/22	24/23	24/20	2020	2021	2022	2023	2024
Austria	11.7	12.4	12.5	12.4	11.9	0.7	0.1	-0.1	-0.5	0.2	27	27	27	27	27
Belgium	17.6	16.3	16.7	16.3	15.7	-1.3	0.4	-0.4	-0.6	-1.9	15	18	18	17	19
Bulgaria	33.1	31.3	31.8	29.1	29.2	-1.8	0.5	-2.7	0.1	-3.9	2	2	2	2	1
Croatia	20.9	21.4	20.2	21.4	22.1	0.5	-1.2	1.2	0.7	1.2	9	10	9	8	6
Cyprus	14.5	14.3	13.6	13.9	15.1	-0.2	-0.7	0.3	1.2	0.6	21	22	24	25	22
Czechia	11.3	10	11	10.9	9.9	-1.3	1	-0.1	-1	-1.4	28	28	28	28	28
Denmark	16.3	17.1	17	17.4	17.7	0.8	-0.1	0.4	0.3	1.4	18	16	16	15	13
Estonia	22.9	22.1	25.5	23.7	21.9	-0.8	3.4	-1.8	-1.8	-1	7	8	4	6	7
EU-27	19.5	19.5	19.3	18.9	18.6	0	-0.2	-0.4	-0.3	-0.9	11	11	11	11	12
Finland	14.3	13.8	15.9	15.6	15.7	-0.5	2.1	-0.3	0.1	1.4	22	24	21	21	19
France	15.5	16.3	16.9	16.7	16.8	0.8	0.6	-0.2	0.1	1.3	19	18	17	16	17
Germany	17.6	17.9	17.7	17.7	17.7	0.3	-0.2	0	0	0.1	15	15	15	13	13
Greece	25.3	26.4	24.7	24.6	25.8	1.1	-1.7	-0.1	1.2	0.5	4	3	6	5	4
Hungary	18.4	18.3	18	18.5	19.8	-0.1	-0.3	0.5	1.3	1.4	13	13	14	12	10
Ireland	17.6	18.1	18.8	17.5	15.3	0.5	0.7	-1.3	-2.2	-2.3	15	14	13	14	21
Italy	22.4	22.6	22.3	20.6	21.1	0.2	-0.3	-1.7	0.5	-1.3	8	7	7	9	8
Latvia	25.4	25.8	26.3	25.3	23.9	0.4	0.5	-1	-1.4	-1.5	3	4	3	3	5
Lithuania	24.8	23.9	25	24.9	26.6	-0.9	1.1	-0.1	1.7	1.8	5	5	5	4	2
Luxembourg	13.7	13.9	13.4	14.9	14.5	0.2	-0.5	1.5	-0.4	0.8	25	23	25	23	24
Malta	19.2	19.4	19.1	15.8	17.6	0.2	-0.3	-3.3	1.8	-1.6	12	12	12	19	15
Netherlands	15.2	16.1	16.3	14.8	14.1	0.9	0.2	-1.5	-0.7	-1.1	20	20	19	24	26
Poland	18	16.9	15.8	16.3	16	-1.1	-1.1	0.5	-0.3	-2	14	17	22	17	18
Portugal	19.6	22.1	19.8	19.4	19.2	2.5	-2.3	-0.4	-0.2	-0.4	10	8	10	10	11
Romania	34.4	32.7	32.7	30.4	26.4	-1.7	0	-2.3	-4	-8	1	1	1	1	3
Slovakia	12.8	14.6	14.6	15.7	17.2	1.8	0	1.1	1.5	4.4	26	21	23	20	16
Slovenia	14.2	13.4	13.4	13.9	14.4	-0.8	0	0.5	0.5	0.2	23	26	25	25	25
Spain	23.2	23.4	21.7	22.1	20.6	0.2	-1.7	0.4	-1.5	-2.6	6	6	8	7	9
Sweden	14	13.6	16.1	15.2	14.8	-0.4	2.5	-0.9	-0.4	0.8	24	25	20	22	23

Source: Authors' calculations based on Eurostat (2025c) data.

Note: * Percentage points.

At the EU-27 level, the share of persons at risk of poverty or social exclusion decreased from 19.5% in 2020. to 18.6% in 2024. This decline suggests that economic recovery measures and social policies across the EU have had a positive effect, especially in post-pandemic period.

Some countries consistently show higher rates of poverty and social exclusion risk. Romania (34.4% in 2020. → 26.4% in 2024.) and Bulgaria (33.1% in 2020. → 29.2% in 2024.) have the highest levels within the EU, despite gradual improvements. Latvia (25.4% in 2020. → 23.9% in 2023.) and Lithuania (24.8% in 2020. → 26.6% in 2024.) also maintain relatively high rates of mentioned indicator, while Greece (25.3% in 2020. → 25.8% in 2024.) shows slight fluctuations but remains among the most vulnerable EU countries.

Other countries consistently exhibit lower rates of poverty risk. Czechia (11.3% in 2020. → 9.9% in 2024.) and Austria (11.7% in 2020. → 11.9% in 2024.) maintain relatively low levels. Luxembourg (13.7% in 2020. → 14.5% in 2024.) and Slovenia (14.2% in 2020. → 14.4% in 2024.) also report stable and lower risks compared to the EU average.

Spain (23.2% in 2020. → 20.6% in 2024.) and Italy (22.4% in 2020. → 21.1% in 2024.) show moderate declines, suggesting some progress in poverty reduction efforts. Denmark (16.3% in 2020. → 17.7% in 2024.), Finland (14.3% in 2020. → 15.7% in 2024.), and Sweden (14.0% in 2020. → 14.8% in 2023.) exhibit a slight increase in poverty risk, which may indicate some emerging socio-economic pressures in Nordic countries. Portugal (19.6% in 2020. → 19.2% in 2023.) reaches a peak in 2021. (22.1%) before stabilizing, possibly due to pandemic-related economic challenges.

Differences in socio-economic patterns, governmental responses, and robustness of national welfare systems are sought through varying trends of indicator among the observed countries for the period 2020-2023. Moderate declines in Italy and Spain point to the success of focused initiatives to reduce poverty and boost the economy growth. In contrast, even though Denmark, Finland, and Sweden have historically had robust social safety systems, their modest growth may be due to increased inequality, changes in the labor market, and rising living expenses. Portugal's volatility, which reached its peak in 2021., demonstrates the COVID-19 pandemic's immediate effects on population that was already at risk before stabilizing, i.e. taking recovery efforts. Noticed relationships highlight how national policy decisions, economic systems, and social safety nets influence the poverty and marginalization.

The EU as a whole has experienced a reduction in the risk of poverty among the population, but the differences are still significant. Eastern European countries (Romania, Bulgaria and Lithuania) continue to face a high risk of poverty, while the western and northern countries experience a stable but slightly rising trend. Continued efforts to secure social protection, wage growth and targeted support are needed to ensure sustained progress in reducing the risks of poverty in all EU countries.

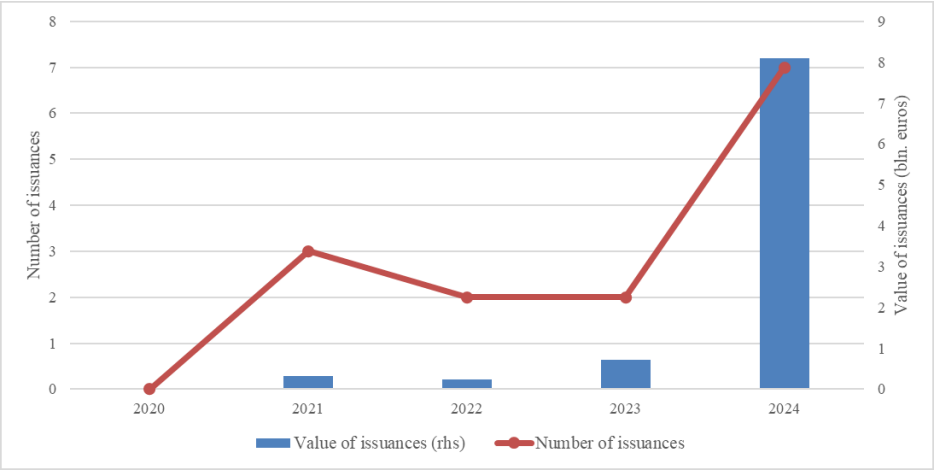
This persistent gap between the EU countries indicates how GF may be used as a tactical instrument to promote rural development by financing climate-resilient agriculture, renewable energy, and sustainable infrastructure. In accordance with the European Green Deal and Agenda 2030, integrating GF programs with rural development strategies might accelerate efforts to reduce poverty, while advancing environmental and social sustainability goals.

In addition, the systemic role of GF in reducing poverty and the risk of social exclusion highlights its multiple benefits, promoting not only environmental well-being but also economic stability and equity in developing contexts (Jiang et al., 2020).

Green bond issuances

Green bonds are structured like traditional bonds but include a critical distinction: the proceeds are exclusively directed toward environmentally and socially beneficial projects, such as renewable energy, clean transportation, sustainable water use, or climate change adaptation (Sartzetakis, 2021). As instruments of GF, they represent a pivotal component of the broader GF path, mobilizing both private and public capital in pursuing the long-term sustainability goals. Figure 5. shows the evolution of the green bonds market in Romania (value and number of issuances) during the period 2020-2024.

Figure 5. Evolution of the green bonds market in Romania, period 2020-2024.



Source: Authors' calculations based on LSEG (2025) data.

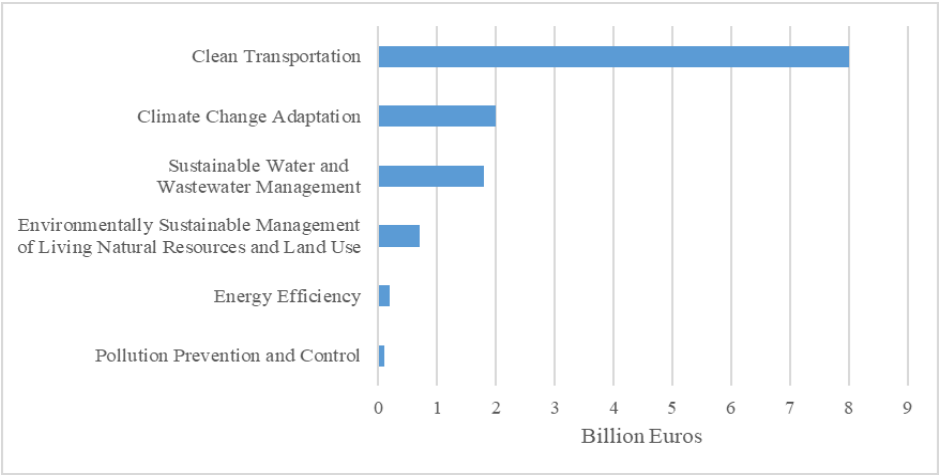
In the case of Romania, green bond issuances have emerged as a strategic financial tool supporting the transition toward sustainable rural development. From 2021. to 2023., green bond activity was primarily driven by actors from the corporate and financial sector, with issuances financing projects in clean energy, green buildings, and energy-efficient infrastructure. These early-stage initiatives, although modest in value and number, made the foundation for more robust green finance mechanisms aimed at rural modernization. Romania began issuing green bonds in 2021., while the first issuance has been carried out by Raiffeisen Bank in May 2021. This marked the first green bond issued by a financial institution in Romania, with proceeds intended to finance projects in renewable energy, energy efficiency, and clean transport.

Since then, the issuance of green bonds in Romania has shown a clear upward trend. However, both the number and value of issuances remained relatively modest (period 2021-2023), with the market mainly driven by huge multinational and financial companies. Notably, in May 2023, Banca Comercială Română (BCR) issued a landmark 0.7 billion EUR green Eurobond, the first international green bond by a Romanian bank. The proceeds were directed towards renewable energy projects, green mortgages, and green buildings. This surge in private-sector activity demonstrated growing market interest, although the average deal size has remained small, suggesting that the market is still in its early developmental stage.

A turning point occurred in 2024. when the Romanian government issued its first sovereign green bonds. This represents a significant shift from privately-led to state-led financing approach and signals national-level commitment to funding climate-resilient infrastructure and inclusive rural growth. The government's participation began with Romania's debut sovereign green Eurobond of 2 billion EUR in February 2024., followed by additional tranches, including a 33 billion Samurai (JPY) green bond (around 0.2 billion EUR) in October 2024. These large issuances caused the 2024. green bonds volume to dwarf previous years. Consequently, the average issuance size in 2024. was much larger, reflecting the scale of sovereign borrowing.

The proceeds from these bonds were channeled into initiatives such as renewable energy deployment in rural areas, forest conservation, and energy efficiency upgrades, i.e. the projects with direct implications for improving living standards in underdeveloped regions. Figure 6. shows the estimated expenses per each category of Eligible Green Projects.

Figure 6. Estimated expenses per each category of Eligible Green Projects



Source: Adapted from Romania's Sovereign Green Bond Framework (Romanian Government, 2023).

According to Figure 6., within the Green projects (Romanian Government), category with the highest expenses is the Clean Transportation. It is followed by the Climate Change Adaptation and Sustainable Water, and Wastewater Management projects. It is fair to admit that Clean Transportation projects do not necessarily have a profound impact on rural communities, as the highest share of estimated budget is turned for developing the Bucharest and Cluj-Napoca metro systems, as well as installing charging points for electric vehicles. However, other categories definitely have a significant impact on rural development. For example, investments in water supply and water treatment facilities in rural areas boosts the sustainable development of these areas. Moreover, investments in reconstruction of existing irrigation-drainage and flood defense infrastructure, as part of Climate Change Adaptation projects, can help reduce the impact of physical climate perils in rural communities. Sustainable management of living natural resources and land use projects promotes extensive agricultural and forestry practices which, in turn, increase the added value of mentioned sectors in rural areas.

Importantly, Romania's sovereign green bonds issuances not only increased the scale and credibility of the green bond market, but also lowered entry barriers for future issuers, including local authorities and rural cooperatives. By aligning GF tools with rural policy objectives, Romania demonstrated how green bonds can address regional disparities and promote a balanced GF path that supports both EG and sustainability. As such, green bond issuances in Romania exemplify how innovative financial instruments can play a catalytic role in achieving rural revitalization, aligning with SDGs and European Green Deal targets. If continued and expanded, this trajectory has the potential to accelerate rural transitions, attract further private-sector participation, and secure long-term investment in sustainable development initiatives across Romania's most vulnerable communities.

Limitations of the study

Despite contributions in understanding the relationship between EG, GF, and sustainable rural development, this study has certain limitations. First represents insufficient availability of relevant and clear data, potentially affecting the accuracy of the analysis. Limited access to latest, granular, region-specific data also constrained the ability to conduct a more detailed examination of local disparities and trends. Another challenge arises from the socio-economic diversity of Romanian counties, which do not enable generalization of research findings at a national level. Each region exhibits distinct economic structures, investment patterns, and environmental conditions, affecting the effectiveness of GF initiatives differently. This variability complicates the formulation of policy recommendations that would be equally applicable across all regions.

Furthermore, the study is constrained by the complex interactions among social, economic, and environmental factors, which introduce challenges in isolating the specific impact of GF on sustainable rural development. The interconnected nature of these variables means that changes in one domain, such as EG, can have cascading effects on other dimensions, making it difficult to attribute observed trends to a single cause.

Acknowledging mentioned limitations derives foundation for future research, securing more comprehensive datasets, region-specific case studies, and advanced econometric modelling to better assess the long-term impact of GF on sustainable rural development.

Conclusion and Recommendations

The findings of this research confirm that GF has a measurable and positive impact on sustainable rural development in Romania. Analysis of green bond issuances, SHDI trends, and poverty indicators demonstrates that aligning financial instruments with sustainability goals can support regional resilience, further reduce socio-economic disparities, and mobilize targeted investments. Moreover, the state's involvement in the green bond market significantly increased its credibility and access, proving the catalytic role of public sector leadership in accelerating the GF paths across the rural regions.

GF is an integral part of the approach to supporting sustainable EG, as it fosters investments in environmentally friendly and socially acceptable projects that are essential for balancing economic needs with environmental and social sustainability.

A comprehensive policy landscape (that supports the EU's regional objectives) will equip rural areas to attract investments and nurture sustainable growth. However, achieving these objectives is contingent upon establishing the necessary infrastructure to bridge the gap between rural realities and EU funding mechanisms. Necessity of strong policy frameworks is critical for effective mobilization of resources as support of sustainable development objectives. This approach is vital for tackling the interconnected issues of rural poverty and environmental degradation.

Romania can achieve sustainable rural development through an integrative approach that combines EG with GF. With diligent policy formulation, community involvement, and leveraging sectors such as tourism, the country can create a balanced framework conducive to both economic and environmental health. This approach not only addresses the immediate local concerns, but also aligns with broader global development goals. Based on the conducted research, a few recommendations are derived for policymakers, private sector entities, and local administrations.

Policymakers should establish transnational multi-stakeholder partnerships that can facilitate shared knowledge and resources, enhancing the effectiveness of sustainable development initiatives. Moreover, policymakers should prioritize the creation of robust policy frameworks that integrate SDGs with local EG strategies. Such frameworks should align incentives for sustainable practices with investment in GF initiatives effectively addressing the dual challenges of rural poverty and environmental degradation.

Private sector entities could promote the development of green technology, such as solar or wind power systems, enhancing the economic resilience in rural communities.

Considering local administration, it is primarily recommended the integration of circular economy principles into the local development. Local administration should also explore innovative GF instruments in order to mobilize capital for sustainable rural projects. This includes developing programs that promote agricultural investments through green bonds or impact funds, ensuring that mentioned financial products will prioritize projects with significant environmental benefits.

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References

1. Adamov, T., Ciolac, R., Iancu, T., Brad, I., Pet, E., Popescu, G., Smuleac, L. (2020). Sustainability of agritourism activity. initiatives and challenges in Romanian mountain rural regions. *Sustainability,* 12(6):2502, https://doi.org/10.3390/su12062502
2. Adisa, O., Ilugbusi, B., Chimezie, O., Awonuga, K., Asuzu, O. (2024). Green bonds in climate finance: A review of USA and African initiatives. *International Journal of Science and Research Archive,* 11(1):2376-2383, https://doi.org/10.30574/ijsra.2024.11.1.0147
3. Azhgaliyeva, D., Liddle, B. (2020). Introduction to the special issue: Scaling Up Green Finance in Asia. *Journal of Sustainable Finance & Investment,* 10(2):83-91, https://doi.org/10.1080/20430795.2020.1736491

4. Backstrand, K. (2022). *Towards a climate-neutral union by 2050? The European green deal, climate law, and green recovery*. In: Bakardjieva Engelbrekt, A., Ekman, P., Michalski, A., Oxelheim, L. (eds.) Routes to a resilient European Union: Interdisciplinary European Studies. Palgrave Macmillan, Cham, Switzerland, pp. 39-61, https://doi.org/10.1007/978-3-030-93165-0_3
5. Badircea, R., Florea, N., Manta, A., Puiu, S., Doran, M. (2020). Comparison between Romania and Sweden Based on Three Dimensions: Environmental Performance, Green Taxation and Economic Growth. *Sustainability,* 12(9):3817, https://doi.org/10.3390/su12093817
6. Bhutta, U., Tariq, A., Farrukh, M., Raza, A., Iqbal, M. (2022). Green bonds for sustainable development: Review of literature on development and impact of green bonds. *Technological Forecasting and Social Change,* 175:121378, https://doi.org/10.1016/j.techfore.2021.121378
7. Bracking, S., Leffel, B. (2021). Climate finance governance: Fit for purpose? *Wiley Interdisciplinary Reviews Climate Change,* 12(4):e709, https://doi.org/10.1002/wcc.709
8. Dwivedy, D., Sharma, M. (2023). Role of green bonds in promoting sustainability and their effects on public policy. *Journal of Law and Sustainable Development,* 11(6):1-17(e01186), https://doi.org/10.55908/sdgs.v11i6.1186
9. Eurostat (2025a). *Life expectancy at birth by sex and NUTS 2 region*. https://doi.org/10.2908/TGS00101
10. Eurostat (2025b). *Number of households by degree of urbanization and NUTS 2 region (in 000)*. https://doi.org/10.2908/LFST_R_LFSD2HH
11. Eurostat (2025c). *Persons at risk of poverty or social exclusion by group of citizenship (population aged 18 and over)*. https://doi.org/10.2908/ILC_PEPS05N
12. Eurostat (2025d). *Tertiary educational attainment, age group 25-64 by sex and NUTS 2 region*. https://doi.org/10.2908/TGS00109
13. Florea, N., Duica, M., Ionescu, C., Duica, A., Ibinceanu, M., Stanescu, S. (2021). An analysis of the influencing factors of the Romanian agricultural output within the context of green economy. *Sustainability,* 13(17):9649, https://doi.org/10.3390/su13179649
14. Guo, L., Zhao, S., Song, Y., Tang, M., Li, H. (2022). Green finance, chemical fertilizer use and carbon emissions from agricultural production. *Agriculture,* 12(3):313, https://doi.org/10.3390/agriculture12030313

15. Iacobuta, A., Asandului, L., Cautisanu, C. (2020). Assessment of Economic Growth in Romania. Is it a Sustainable One? *European Journal of Sustainable Development,* 9(3):513, https://doi.org/10.14207/ejsd.2020.v9n3p513
16. Ibinceanu, C., Cristache, N., Dobrea, R., Florescu, M. (2021). Regional Development in Romania: Empirical Evidence Regarding the Factors for Measuring a Prosperous and Sustainable Economy. *Sustainability*, 13(7):3942, https://doi.org/10.3390/su13073942
17. Ionescu, S., Chirita, N., Nica, I., Delcea, C. (2023). An analysis of residual financial contagion in Romania's banking market for mortgage loans. *Sustainability,* 15(15):12037, https://doi.org/10.3390/su151512037
18. Jiang, L., Wang, H., Tong, A., Hu, Z., Duan, H., Zhang, X., Wang, Y. (2020). The measurement of green finance development index and its poverty reduction effect: Dynamic panel analysis based on improved entropy method. *Discrete Dynamics in Nature and Society*, 2020(1):8851684, https://doi.org/10.1155/2020/8851684
19. Kandzija, V., Tomljanovic, M., Kandzija, T. (2020). Innovations and Economic Growth in Romania - Current State and Perspectives. *LUMEN Proceedings,* 10:116-125, https://doi.org/10.18662/lumproc/gidtp2018/14
20. Lazarova, E., Pavlov, P., Petrova, M., Shalbayeva, S. (2023). Analysis and assessment of infrastructural potential in rural territories. *Economics Ecology Socium,* 7(1):1-14, https://doi.org/10.31520/2616-7107/2023.7.1-1
21. Lingmin, Q. (2024). Research review and outlook on green finance assisting rural revitalization. Acad*emic Journal of Humanities & Social Sciences,* 7(2):209-216, https://doi.org/10.25236/ajhss.2024.070229
22. LSEG (2025). *Equity & Bonds [Financial Data]*. London Stock Exchange Group PLC (LSEG), London, UK, retrieved at: www.lseg.com/en, 29th May 2025.
23. Ma, Z., Liu, Z., Zhang, P., Wei, X., Chen, W. (2024). Analysis of the impact of digital inclusive finance on the development of green agriculture. *Agronomy,* 14(12):2777, https://doi.org/10.3390/agronomy14122777
24. Maltais, A., Nykvist, B. (2020). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance & Investment,* 1-20, https://doi.org/10.1080/20430795.2020.1724864
25. Marecki, K., Wojcik Czerniawska, A., Grzymala, Z. (2022). *Financing sustainable economic growth: Evidence from Europe*. In: Bilgin, M., Danis, H., Demir, E., Bodolica, V. (eds.) Eurasian Business and Economics Perspectives, Springer International Publishing, Cham, Switzerland, vol. 23, pp. 289-306, https://doi.org/10.1007/978-3-031-14395-3_16

26. Mihai, F., Aleca, O., Gogu, E., Dobrin, C., Gheorghe, M. (2021). The challenges of the green economy in Romania: Scientific literature review. *Sustainability*, 13(23):13113, https://doi.org/10.3390/su132313113
27. Milićević, S., Đorđević, N., Kraguljac, V. (2024). *Wine Tourism and Sustainable Rural Development.* In: Cvijanovic et al. (eds.) Tourism International Scientific Conference Vrnjačka Banja - TISC, proceedings, 8(1):419-428, https://doi.org/10.52370/TISC24419SM
28. Nica, I., Georgescu, I., Delcea, C., Chirița, N. (2023). Toward Sustainable Development: Assessing the Effects of Financial Contagion on Human Well-Being in Romania. *Risks,* 11(11):204, https://doi.org/10.3390/risks11110204
29. Nie, C., Yao, Y., Feng, Y. (2024). The impact of green finance on economic growth: Evidence from the green finance reform and innovation pilot zone. *American Journal of Economics and Sociology,* 83(4):709-736, https://doi.org/10.1111/ajes.12573
30. Nita, D., Stoicuta, N., Nitescu, A., Isac, C. and Dobre Baron, O. (2025). The impact of the transition to a green economy on Romania's economic growth. *Energy, Sustainability and Society*, 15:19, https://doi.org/10.1186/s13705-025-00520-4
31. Pauceanu, A., Sahli, S. (2016). Sustainable economic development policies in Romania within the EU and Brexit Context. *Journal of Security and Sustainability Issues,* 6(1):167-178.
32. Radulescu, M., Sinisi, C., Popescu, C., Iacob, S., Popescu, L. (2017). Environmental Tax Policy in Romania in the Context of the EU: Double Dividend Theory. *Sustainability*, 9(11):1986, https://doi.org/10.3390/su9111986
33. Romanian Government (2023). *Romania's Sovereign Green Bond Framework.* Romanian Government, Bucharest, Romania, retrieved at: https://mfinante.gov.ro/static/10/Mfp/trezorerie/GreenBondFrameworkofRomania_14022024.pdf
34. Sartzetakis, E. (2021). Green bonds as an instrument to finance low carbon transition. *Economic Change and Restructuring,* 54(3):755-779, https://doi.org/10.1007/s10644-020-09266-9
35. Sinha, A., Mishra, S., Sharif, A., Yarovaya, L. (2021). Does green financing help to improve environmental & social responsibility? Designing SDG framework through advanced quantile modelling. *Journal of Environmental Management,* 292:112751, https://doi.org/10.1016/j.jenvman.2021.112751
36. Smits, J., Permanyer, I. (2019). The Subnational Human Development Database. *Scientific Data,* 6:190038, https://doi.org/10.1038/sdata.2019.38

37. Stanciu, S., Zlati, M., Antohi, V., Bichescu, C. (2019). The development analysis of the Romanian traditional product market based on the performance model for sustainable economic development. *Sustainability,* 11(4):1123, https://doi.org/10.3390/su11041123
38. Tamasila, M., Ivascu, L., Artene, A. (2023). Sustainable development and market trends in Romania. *Scientific Bulletin of the Politehnica University of Timişoara: Transactions on Engineering and Management*, 4(1):14-18, https://doi.org/10.59168/tvgp6152
39. Tolliver, C., Keeley, A., Managi, S. (2019). Green bonds for the Paris agreement and sustainable development goals. *Environmental Research Letters,* 14(6):064009, https://doi.org/10.1088/1748-9326/ab1118
40. Tutak, M. (2020). Analysis of Gas and Dust Emissions from the Mining and Quarrying Sector in the European Union Countries. *Multidisciplinary Aspects of Production Engineering,* 3(1):71-82, doi: 10.2478/mape-2020-0006
41. Wang, W., Lin, J., He, T., Zhao, H., Zhao, X. (2022). Coupling coordination analysis of green finance and industrial technology innovation: A case study in Zhejiang province, China. *Frontiers in Environmental Science*, 10:958311, https://doi.org/10.3389/fenvs.2022.958311
42. Wu, T. (2023). *Regional Innovation for Sustainable Development: The Case of Romania and China*. In: Pamfilie, R., Dinu, V., Vasiliu, C., Plesea, D., Tachiciu, L. (eds.) 9th BASIQ International Conference on New Trends in Sustainable Business and Consumption, proceedings, ASE, Bucharest, Romania, pp. 288-294, doi: 10.24818/BASIQ/2023/09/058
43. Xu, J., She, S., Gao, P., Sun, Y. (2023). Role of green finance in resource efficiency and green economic growth. *Resources Policy*, 81:103349, https://doi.org/10.1016/j.resourpol.2023.103349
44. Xue, Y., Ma, T., Zhuang, T., Ma, Y. (2023). The development of green finance under the goal of carbon neutrality: A review from China's perspective. *Frontiers in Earth Science,* 11:1123020. https://doi.org/10.3389/feart.2023.1123020
45. Zheng, G., Siddik, A., Masukujjaman, M., Fatema, N., Alam, S. (2021). Green finance development in Bangladesh: The role of private commercial banks (pcbs). *Sustainability,* 13(2):795, https://doi.org/10.3390/su13020795