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Assessing Romania's progress towards Sustainable Development Goals 8, 9, 10 and 12: a comparative analysis in the EU context

Irina Puiu[1]

[1] Faculty of Agrifood and Environmental Economics, Bucharest University of Economic Studies, Bucharest, Romania, ORCID: 0009-0002-9667-7085

E-mail: puiuirina19@stud.ase.ro

Abstract. The concept of sustainable development, as introduced in the 1987 Brundtland Report and globally formalized through the United Nations' 2030 Agenda, has become a cornerstone for addressing economic, social, and environmental challenges worldwide. This article provides an in-depth analysis of Romania's progress in achieving four key Sustainable Development Goals (SDGs): SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 12 (Responsible Consumption and Production). Using data from the National Institute of Statistics of Romania, this study evaluates the country's performance by comparing it to the European Union average, top international performers, and economies with similar profiles. The analysis covers a range of indicators, including employment rates, industrial innovation, income inequality, and environmental sustainability, shedding light on Romania's strengths and weaknesses in these areas. Romania has made notable progress in reducing unemployment and increasing gross national income per capita, contributing to positive trends in economic growth. However, significant challenges remain in the areas of industrial innovation, reducing inequalities, and achieving more sustainable consumption and production patterns. The findings reveal that while Romania is moving towards its 2030 targets, gaps persist, particularly in aligning with EU benchmarks on social inclusion and environmental responsibility. This study highlights the need for continued policy interventions, greater investment in research and innovation, and stronger public-private partnerships to accelerate Romania's progress toward sustainable development. The article concludes with policy recommendations aimed at enhancing Romania's ability to meet its 2030 SDG commitments, ensuring a more equitable and sustainable future.
Keywords: *sustainable development, Romania, SDGs, decent work, economic growth, industry innovation, infrastructure, inequality, consumption, production*

1. Introduction

Concerns about the impact of economic growth on the natural environment emerged as early as the 1960s and 1970s, but the modern concept of sustainable development was formalized in 1987 following the publication of the **"Our Common Future"** report. Studies from the 1980s and 1990s identified factors such as uncontrolled population growth, intensive resource use, and technological progress as primary causes of the environmental problems humanity faces today.[2]

A pivotal moment in the relationship between humanity and the environment was the adoption of the **2030 Agenda**, which introduced 17 Sustainable Development Goals (SDGs) along with 169 specific targets.[2] **Jeffrey Sachs**, a leading theorist and advocate of sustainable development, played a crucial role in defining these goals. In his book **"The Age of Sustainable Development"** Sachs examined sustainable development from a multidisciplinary perspective, integrating economic, environmental, and social aspects, and highlighted the importance of inclusive economic growth and the fight against poverty and social inequalities.[6]

Sustainable development, as described by Sachs and the Brundtland Report, involves the interdependence of economy, equity, and ecology, a concept known as the **"3 E's theory"**. These values are fundamental to the sustainable development process adopted by the United Nations. According to Putină & Terentii [5], the well-being of the population requires the fulfillment of multidimensional security conditions, not only military but also political, ecological, and social. As such, sustainable development has become a crucial concept for overall quality of life.

Sustainability, a central notion in sustainable development, has been characterized by **Ozlili** as "a challenging task." In the literature, sustainability is defined as the philosophy or practice of using resources efficiently to ensure their availability and adequacy for both current needs and those of future generations. It involves responsible resource use and allocation to achieve desired social, economic, and environmental outcomes.[3]

The implementation and achievement of the objectives established through the **2030 Agenda** are essential steps that Romania has committed to in its transition to a circular economy. Among the 17 Sustainable Development Goals (SDGs), the ones selected for this chapter are among the most important and relevant. This assertion is based on the fact that achieving these goals is crucial for sustainable development, as they provide a holistic framework for addressing economic, social, and environmental issues, leading to a fairer and more prosperous future for all citizens. By pursuing these four objectives, Romania can simultaneously enhance its competitiveness, reduce inequalities, and ensure the protection of the natural environment.

It is also important to note that many targets are shared among several objectives, and some of the targets for the four selected SDGs are also included within other objectives. This factor supported the choice of these four objectives for analysis in Romania.

To transition to a sustainable economy, Romania needs a strong economy and an improved standard of living. **SDG 8** promotes this growth model, which is crucial for reducing unemployment and increasing economic efficiency. **Infrastructure** is essential for development; without it, progress is not possible. Innovation and a focus on industry are also fundamental for economic growth. **SDG 9** addresses these aspects by ensuring increased research capacity, the application of sustainability principles in industry, and the provision of adequate infrastructure.

People, along with the natural environment, are at the core of sustainable development, making **SDG 10** and **SDG 12** particularly important. **SDG 10** focuses on reducing inequalities, promoting social inclusion, and advancing equitable policies, while **SDG 12** aims at encouraging sustainable practices in consumption and production. Romania's environmental challenges, existing inequalities, and inefficiencies in certain sectors underscore the importance of these SDGs.

The objectives of this research are to critically examine Romania's progress toward achieving sustainable development by focusing on four selected Sustainable Development Goals: SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 10 (Reduced Inequality), and SDG 12 (Responsible Consumption and Production). This study aims to assess the country's transition to a circular economy, evaluate the implementation of sustainability principles in its industrial and economic sectors, and analyse the efforts made to reduce social inequalities. Through a detailed analysis of these SDGs, the research seeks to provide insights into the interplay between economic development, social inclusion, and environmental sustainability in Romania. Furthermore, this study will explore how Romania's pursuit of these goals can enhance national competitiveness, foster innovation, and promote a more equitable and environmentally responsible society.

2. Literature Review

Sustainable development has gained significant attention, particularly after the adoption of the 2030 Agenda by the United Nations, which introduced the Sustainable Development Goals (SDGs). This section explores Romania's progress in achieving selected SDGs, with a focus on economic growth, innovation, inequality, and environmental sustainability.

According to Bali Swain and Yang-Wallentin (2020) [1], achieving SDGs requires balancing economic growth with long-term sustainability. Romania has made progress in reducing unemployment and increasing gross national income per capita, but disparities still exist between urban and rural areas. Borbely (2023) [2] also emphasizes that, while economic growth is necessary, Romania must adopt inclusive strategies to ensure that benefits reach all parts of society, especially marginalized rural communities.

Ruggerio (2021) [8] provides a comprehensive review of principles and definitions related to sustainability and sustainable development, emphasizing the complexity and debates surrounding these concepts. Although often used interchangeably, sustainability and sustainable development are distinct and face challenges in their practical application to real systems. The review highlights theoretical definitions, potential, and limitations, focusing on the differences among them. Ruggerio points out to criticisms of sustainable development for the vague definition, as well as to the rise of the sustainability concept in the 1990s, and emerging alternatives like degrowth and buen vivir. The study also underscores the potential of sustainability as a framework for ongoing research and environmental management.

According to Popa and Cara (2020) [4], innovation and sustainability must be at the center of the development agenda, as competitiveness is no longer the sole determining factor of the global economy. They emphasize that all forms of technological innovations, which can lead to sustainable development—such as innovation processes, product innovations, organizational innovations, and market innovations—must be taken into account. Sustainable development may be supported by the innovation process at different levels—national, regional, and international—where it manifests itself in various ways.

Irimie and Munteanu (2013) [13] highlight that, although EU funds absorption in Romania is not satisfactory, there are two important aspects to consider. First, the implemented projects generate results that align with the objectives of sustainable development. Second, each project, regardless of the program, includes horizontal objectives such as sustainable development and gender equality. Thus, every project aims to ensure environmental respect and the social and economic development of the Romanian society. Their paper presents a quantitative analysis of the national and operational programs that contributed to achieving these goals.

In terms of innovation, Firoiu et al. (2019) [10] identify challenges that Romania faces in implementing SDG 9 (Industry, Innovation, and Infrastructure). Although there has been some progress in research and innovation, Romania still lags behind other EU member states in areas such as technological infrastructure and industrial productivity. Deselnicu and Alexandrescu (2020) [11] conducted a comparative analysis of Romania's performance in sustainable development indicators relative to other EU countries, confirming that innovation and industrial development remain areas in need of improvement.

Calabrese et al. (2021) [7] examine the role of Sustainability-Oriented Service Innovation (SOSI) in driving progress toward the SDGs. They argue that companies that integrate service innovation into their strategies can contribute significantly to SDGs, particularly SDG 12 (Responsible Consumption and Production). The study's Sustainability-Oriented Service Innovation Matrix provides a framework for assessing how business strategies align with sustainability goals. This perspective is critical for Romania, where service-sector innovation could play an important role in transitioning industries toward more sustainable practices.

This view aligns with the work of Bartniczak and Raszkowski (2022) [12], who highlight the challenges Romania faces in achieving SDG 11 (Sustainable Cities and Communities). Their research shows that while urban areas have seen significant economic development, rural areas continue to struggle with limited access to basic infrastructure and services.

Environmental sustainability remains a key area of concern for Romania, particularly in terms of waste management and recycling. Poenaru (2021) [15] discusses Romania's difficulties in achieving SDG 12 (Responsible Consumption and Production), noting that low recycling rates and inefficient waste management systems remain significant barriers. Similarly, Slabu (2023) [14] highlights the responsibilities of local authorities in implementing environmental policies, stressing the need for stronger local governance to improve Romania's sustainability efforts.

The work of Confraria, Ciarli, and Noyons (2023) [16] examines research priorities in relation to the SDGs, noting that Romania's research agenda does not fully align with its sustainability challenges. They argue for a more focused research effort on sustainability issues, which could help accelerate the country's progress toward achieving the SDGs.

Finally, "România Durabilă" [9] serves as a crucial resource for tracking the country's progress towards sustainable development goals, aggregating data and policy reports to provide insights into Romania's overall performance, and highlighting areas that require further policy intervention and development.

3. Materials and Methods

The study employs a structured and data-driven approach to assess Romania's progress in achieving four key Sustainable Development Goals (SDGs): SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 12 (Responsible Consumption and Production). Each SDG encompasses multiple priorities, which are monitored through a range of carefully selected indicators. These indicators enable a quantitative assessment of Romania's alignment with the targets set out in the United Nations 2030 Agenda. Given the large number of indicators associated with these goals and the potential overlap between certain metrics (e.g., gross household income and net household income), not all available indicators were included in this analysis. Instead, a targeted selection of indicators was made based on relevance, availability of data, and the ability to effectively measure Romania's progress in each of the SDG areas. The selected indicators were sourced from official data provided by the National Institute of Statistics of Romania. This data was cross-referenced with international benchmarks to provide a comparative analysis of Romania's performance against the European Union average, as well as top-performing and similar economies. The analysis focuses on a range of social, economic, and environmental metrics that are essential for sustainable development.

The following indicators were selected for each SDG:

- ⇒ SDG 8 (Decent Work and Economic Growth): Nine indicators covering four key areas, such as labor market dynamics, income growth, and productivity. These indicators provide insight into Romania's efforts to promote sustained economic growth, reduce unemployment, and foster innovation in the labor market.
- ⇒ SDG 9 (Industry, Innovation, and Infrastructure): Eight indicators covering four core areas related to infrastructure development, research and development (R&D), industrial productivity, and sustainable industrial practices. These indicators track Romania's advancements in improving infrastructure, enhancing industrial innovation, and reducing environmental impacts.
- ⇒ SDG 10 (Reduced Inequalities): Seven indicators focused on three main areas, including income inequality, social inclusion, and access to essential services. These metrics provide a detailed view of Romania's progress in reducing disparities between different socio-economic groups and improving equity in key social sectors.
- ⇒ SDG 12 (Responsible Consumption and Production): Seven indicators covering five specific areas, including waste management, energy consumption, and recycling practices. These indicators are used to evaluate Romania's transition towards more sustainable consumption and

production patterns, and its efforts to reduce the environmental footprint of its economic activities.

A comprehensive description of each selected area and the corresponding indicators is provided in Appendix 1, titled " Selected indicators for key sustainable development objectives in Romania: a focus on economic growth, innovation, inequality and sustainability". This Appendix presents a detailed breakdown of the chosen metrics and explains their relevance to Romania's sustainable development goals.

Data collection and analysis

The data used in this study was collected from publicly available databases and reports provided by the National Institute of Statistics of Romania, as well as relevant European Union sources. Quantitative data was analyzed using statistical methods to assess trends over time, allowing for a dynamic understanding of Romania's progress towards its 2030 targets. In addition, comparative analyses were conducted to benchmark Romania's performance against other EU member states and international standards.

The methodology employed in this study includes dynamic time-series analysis, focusing on key indicators from 2015 to 2022, which helps in identifying trends, progress, and potential areas for improvement. Data visualization techniques, such as graphs and tables, are utilized throughout the study to provide a clear representation of Romania's performance across the selected SDGs.

By narrowing the scope to these four specific SDGs and selecting the most relevant indicators, this research provides a focused yet comprehensive view of Romania's progress towards sustainable development. The results offer valuable insights for policymakers and stakeholders, highlighting both achievements and challenges in Romania's journey towards meeting its 2030 SDG commitments.

The methodology was designed to assess Romania's progress toward achieving Sustainable Development Goals (SDGs) 8, 9, 10, and 12 by employing a structured and data-driven approach. The study relies on quantitative data collected from the National Institute of Statistics of Romania and relevant European Union sources. The methodology is tailored to meet the research objectives by focusing on a set of carefully selected indicators for each SDG, ensuring a comprehensive analysis of Romania's performance in key areas such as economic growth, industrial innovation, inequality reduction, and responsible consumption and production.

Each SDG is evaluated through a range of relevant indicators, including labor market dynamics, income inequality, industrial innovation, and environmental sustainability, chosen based on their relevance to the research objectives and their ability to reflect Romania's progress in the said areas. The analysis involves dynamic time-series evaluations, covering trends from 2015 to 2022, to track Romania's progress over time and compare its performance against the European Union average and other comparable economies. The methodology also incorporates statistical methods and data visualization techniques to provide a clear representation of the findings

This focused approach allows the research to provide insights that directly address the key challenges and opportunities facing Romania in its journey toward meeting its 2030 SDG commitments.

4. Results

The analysis will be presented in a structured format, with a separate section for each of the four selected SDGs.

4.1. The selected indicators for SDG 8 - Decent work and economic growth

For the first target, two indicators were selected, as shown in **Figure 1**. The first indicator, Gross National Income per capita, has exhibited an upward trend from 2015 to 2021. Starting from 35,552 RON per person in 2015, Gross National Income per capita rose to 60,862 RON in 2021 and reached 71,316 RON in 2022 (the year 2022 is not included in the chart due to the lack of data for the second indicator). This increase is notable, exceeding 60% between 2015 and 2021. On the other hand, the growth rate of real GDP per capita was also favorable. A decrease of 3.2% was observed in 2020, but

this was due to the impact of the COVID-19 pandemic on the global economy, including its social effects. Outside of the pandemic year, the annual real GDP growth rate was generally strong, exceeding 6% and reaching up to 8.8% in 2017.

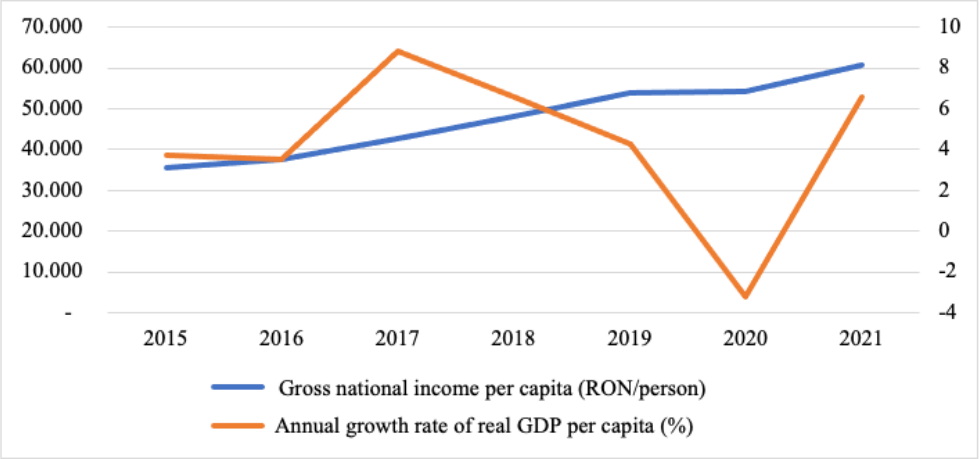

Figure 1. Selected indicators for target 1 of SDG 8 (line 1, Appendix 1).

For the second target under this SDG, three indicators were extracted, as shown in **Figure 2**. The first indicator represents the percentage of GDP allocated to investments in SMEs. This indicator's value remained relatively stable between 2015 and 2021, with the highest percentage recorded during 2015-2016, reaching 6.81%. In 2021, the percentage of GDP allocated to SME investments was 5.44%, showing an increase from the level of below 5% in 2020.

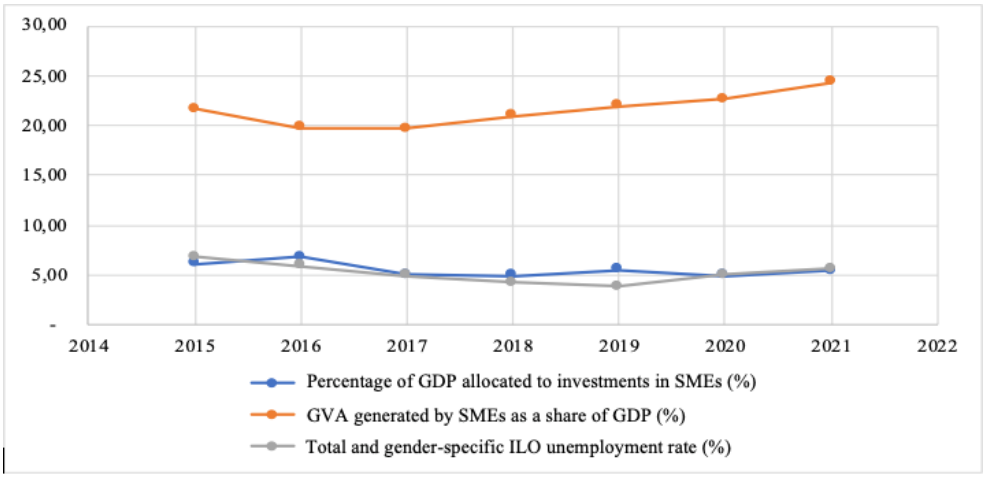

Figure 2. Selected indicators for target 2 of SDG 8 (line 2, Appendix 1).

A distinct trend was observed in the gross value added (GVA) generated by SMEs as a share of GDP. Specifically, after a decline in 2016, which brought the contribution below 20%, a continuous increase in the contribution of SMEs to GDP was noted from 2017 to 2022, reaching close to 25%. This trend is favorable, as SMEs, which are crucial to any economy, have been increasingly contributing to GVA.

The third and final indicator presented in **Figure 2** is the unemployment rate. (The International Labour Organization (ILO) in the field of labour market is updating some essential definitions, including Eurostat's operational definitions of the three ILO employment statuses: employed, unemployed, and outside the labour force.) This indicator dropped to a minimum of 3.9% in 2019, down from 6.8% in

2015, marking a 2.9% decrease. However, following the pandemic year, an increase was observed, with the unemployment rate rising to 5% in 2020 and further to 5.6% in 2021, the highest level since 2016.

For the third target of this SDG, two indicators have been selected, and their evolution from 2015 to 2021 is illustrated in **Figure 3**. The first indicator is the labour productivity growth rate. This indicator shows positive values, with annual increases of over 4%, except for 2019, when the growth was 3.7%. The pandemic year brought a decrease of only 1.7%, which is manageable given the very strong performance in previous years. In 2021, there was a notable increase of 4.9%, helping to recover from the previous year's decline. The second indicator is the nominal average net monthly salary in research and development. As shown in the previous figure, if per capita income has increased, the salary in the research and development sector has followed the same trend, rising from under 4000 RON in 2015 to over 6100 RON in 2021. This represents a 54.8% increase, with an average annual growth rate of 7.6%.

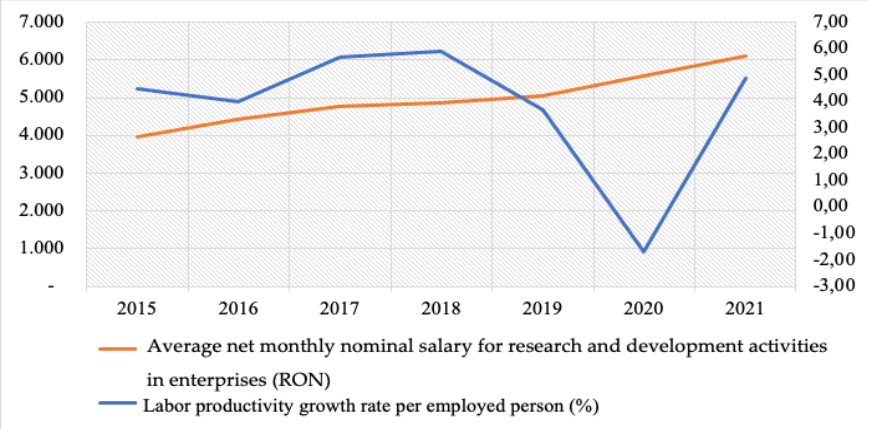

Figure 3. Selected indicators for target 3 of SDG 8 (line 3, Appendix 1).

For the final target selected for this SDG, which focuses on tourism activities, two indicators have been chosen, as shown in **Figure 4**. The number of people employed in hotels and restaurants increased by nearly 24% in 2021 compared to 2015, with an average annual growth rate of 3.8%. This rate was significantly impacted by the 9% decline in 2020. Despite the challenges faced by the sector, employment reached over 195,000 individuals, nearly 40,000 more in 2021 compared to 2015. The share of tourism in GDP followed a similar trend, rising to 3% in 2019 before falling to just 1.6% in 2020. Notably, in 2021, the share increased to 4.9%, the highest within the analysed period.

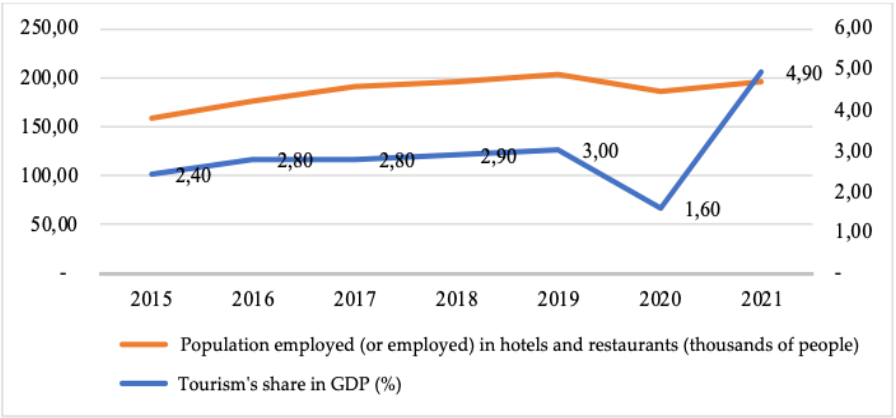

Figure 4. Selected indicators for target 4 of SDG 8 (line 4, Appendix 1)**.**

4.2. The selected indicators for SDG 9 - Industry, innovation, and infrastructure

For SDG 9, four specific segments were selected, each assessed using one or two associated indicators. Regarding the first segment, which focuses on road safety and its subsequent improvements, two indicators were selected. The first indicator is the number of road accidents. According to the data presented in **Figure 5**, this indicator increased from under 29,000 cases in 2015 to over 31,100 cases in 2019. The decrease in 2020, to 22,800 accidents, can be attributed to the lockdown, which significantly reduced traffic. After 2020, there was another increase, reaching over 28,000 road accidents in 2022.

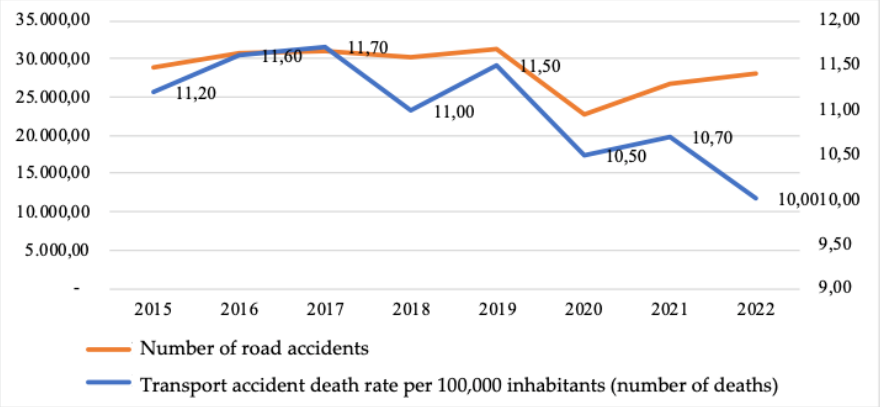

Figure 5. Selected indicators for target 2 of SDG 9 (line 5, Appendix 1).

The second indicator shows a more positive trend. The fatality rate decreased during the analyzed period, from 11.2 deaths per 100,000 inhabitants to 10 deaths per 100,000 inhabitants. This decrease is not significant and is marked by annual fluctuations rather than a continuous downward trend. Thus, from the perspective of road safety, the overall trend is not favorable, as both indicators lead to the same negative conclusion.

For the target related to the sustainability and efficiency of industries, three indicators were selected and are presented in **Table 1**. This format was chosen because the values of the indicators did not allow for graphical representation. Between 2015 and 2021, the Gross Added Value (GAV) from environmental technologies experienced steady growth, with a significant acceleration after 2018, when it exceeded 1.5 billion lei. After this point, the growth became much more pronounced, reaching nearly 5.3 billion lei by 2021. Compared to 2015, this represents an increase of over 377%. Regarding greenhouse gas emissions, a positive trend was also observed starting in 2019. From 2015 to 2018, emissions fluctuated, generally remaining above 100 million tons of CO_2 equivalent. After decreasing to 97.27 million tons in 2019, emissions continued to fall to 92.67 million tons in 2020. However, in 2021, there was a slight increase of nearly 2 million tons of CO_2 equivalent. The share of environmental protection expenditures in GDP ranged from 1.84% in 2017 to 2.81% in 2015. This indicator does not show a clear trend towards increased allocation of GDP for environmental protection.

Table 1. Selected indicators for target 3 of SDG 9 (line 6, Appendix 1).

Year	Value of production and Gross Added Value (GAV) in environmental technologies (million RON)	Greenhouse gas emissions (thousand tons CO_2 equivalent)	Environmental protection expenditures as a percentage of GDP (%)
2015	1.111,40	100.544	2,81
2016	1.050,22	98.462	2,03
2017	1.373,92	100.685	1,84
2018	1.655,88	100.963	2,19
2019	2.668,15	97.270	2,13
2020	4.471,64	92.672	1,93
2021	5.299,69	94.388	2,28

The focus of the next selected objective is represented by scientific research, for which two key indicators have been identified as the most relevant, namely, Total public sector research and development expenditures as percentage of GDP (%) and Researchers in research and development per million of inhabitants, as illustrated in **Figure 6**.

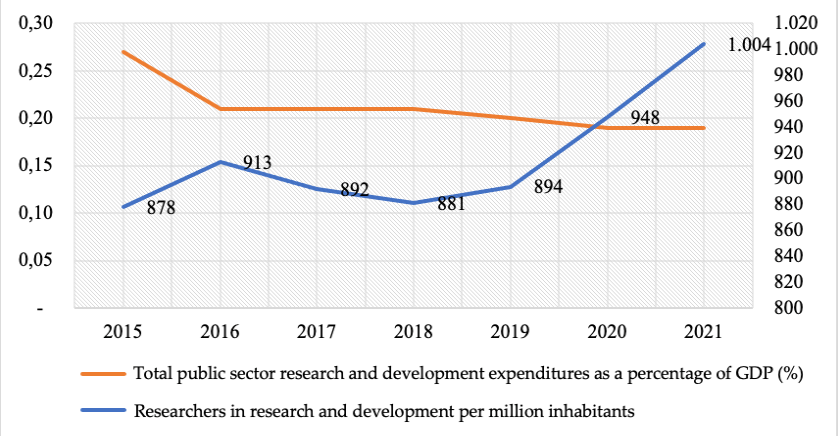

Figure 6. Selected indicators for target 5 of SDG 9 (line 7, Appendix 1).

Comparing research and development expenditures to GDP, as done by the first selected indicator**,** shows a decrease over the analyzed period, from a peak of 0.27% in 2015 to 0.19% in 2020 and 2021. This downward trend is generally observed throughout the period. Although the share of research and development expenditures in GDP was lower, their absolute value increased due to GDP growth, the number of researchers per million inhabitants rose to 1004. After a decline between 2016 and 2018, when the number of researchers fell from 913 to 881 per million inhabitants, nearing the level of 2015, there was a significant increase post-2018, reaching a record level in 2021.

The final selected indicator related to the growth segment in financial services for small businesses was "The value of the balance of foreign trade operations conducted by SMEs." The indicator shown in **Figure 7** does not show a favorable trend, with a negative balance throughout the analyzed period. Moreover, the deficit has been increasing each year, reaching over 21 billion euros in 2021, which is approximately 76% higher than the deficit in 2015.

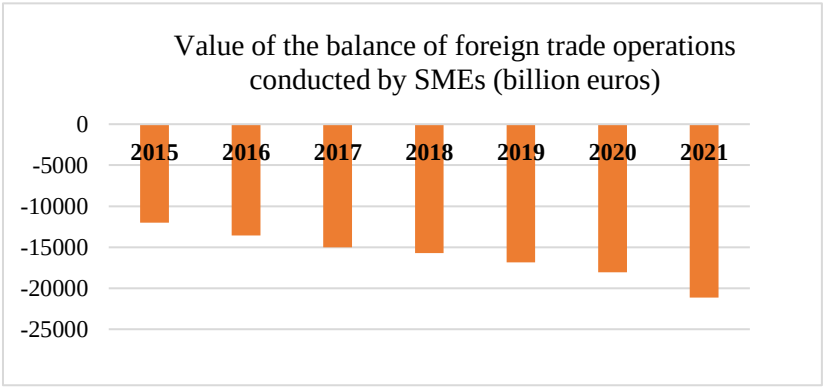

Figure 7. Selected indicators for target 7 of SDG 9 (line 8, Appendix 1).

4.3. The selected indicators for SDG 10 - Reduced inequality

For the first objective, which focuses on inequalities among citizens and their development, three indicators were selected, as shown in **Figure 8**. For the income inequality index and the rate of young people not engaged in any form of education, the period from 2015 to 2022 brought only minimal improvements. The first indicator decreased from 8.3% to 6%, while the second decreased from 18.1%

to 17.5%. For the second indicator, the lowest value reached was 14.5% in 2018, but there was a rising trend afterwards, reaching 18% in 2021.

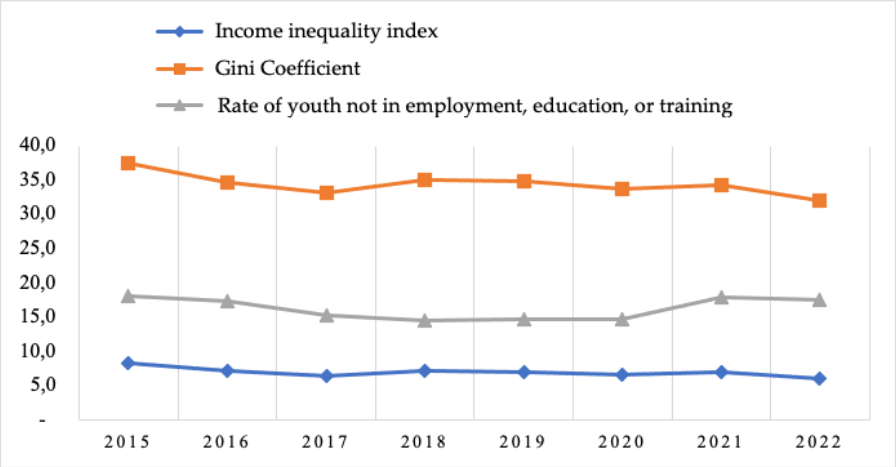

Figure 8. Selected indicators for target 1 of SDG 10 (line 9, Appendix 1).

Regarding the third indicator, the Gini Coefficient, which measures "the proportion of total income that needs to be redistributed to ensure perfect equality among all members of society," the trend is similar to the previous two indicators. Although the trend is positive, the change is relatively small, with the coefficient decreasing from 37.4% in 2015 to 32% in 2022, which is the minimum for the analysed period.

The selected indicators for the second segment of this SDG highlight the importance of comparing Romania's performance to the EU average, as the goal focuses on bringing Romania's values closer to the European community standards (**Figure 9**). For the infant mortality rate, Romania saw an improvement from 7.5 cases per 1,000 live births to 5.2 cases per 1,000 in 2021. This represents a significant decrease of approximately 30.7%, narrowing the gap with the European average, which also declined from 3.6 in 2015 to 3.2 in 2021. The at-risk-of-poverty or social exclusion rate in Romania was over 45% in 2015 and 2016, but it dropped significantly, reaching 34.4% in both 2021 and 2022. This brought Romania closer to the EU average, which was 24% in 2015 and 21.6% in 2021. The final indicator shows the most unfavorable results for Romania, with an average of 12.3% over the analyzed period and little variation across the eight years. Compared to the EU average of nearly 45% during this time, Romania's position is significantly weaker, and the gap has not been reduced in terms of this indicator.

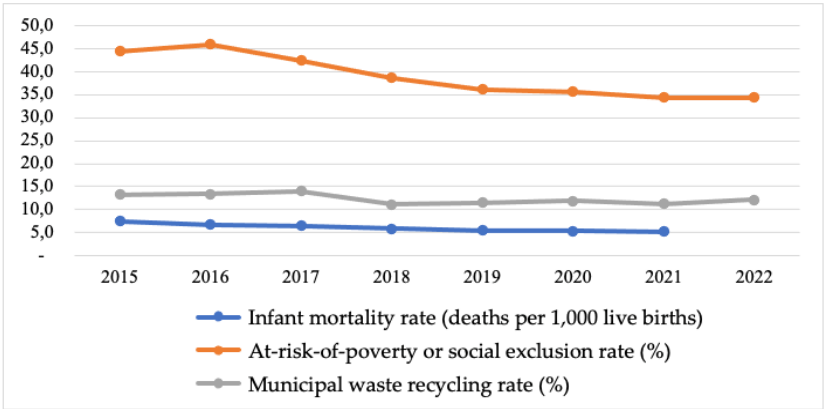

Figure 9. Selected indicators for target 2 of SDG 10 (line 10, Appendix 1).

The third segment defined by Romania for this SDG is represented by the number of discrimination complaints received by the National Council for Combating Discrimination (CNCD) (**Figure 10**). Thus, all three segments proposed by the Romanian state have been covered for this SDG. The number of complaints received by CNCD fluctuated between 2015 and 2023, with the highest figure recorded in 2020, reaching 1,063 cases. The threshold of 1,000 cases was met or exceeded again in both 2021 and 2023.

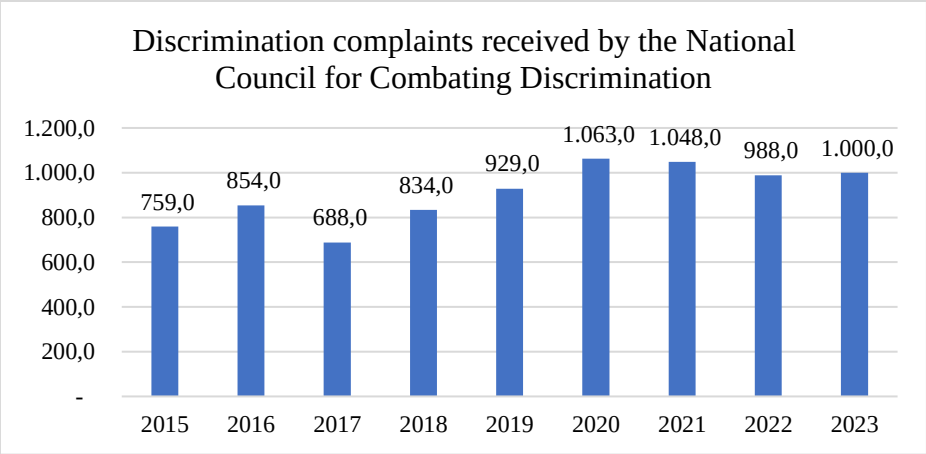

Figure 10. Selected indicators for target 3 of SDG 10 (line 11, Appendix 1).

4.4. The selected indicators for SDG 12 - Responsible consumption and production

For SDG 12, five specific segments were selected. For the first of these, which pertains to the transition to a responsible consumption and production model, three indicators were introduced, as shown in **Figure 11.**

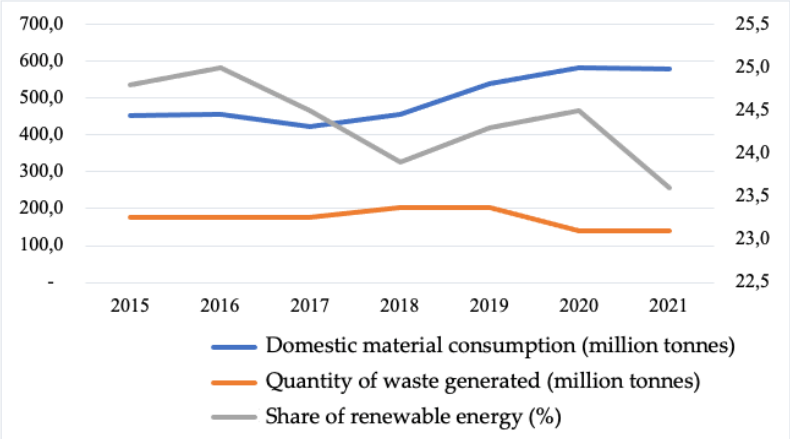

Figure 11. Selected indicators for target 1 of SDG 11 (line 12, Appendix 1).

According to **Figure 11**, the internal consumption of materials shows a progressive increase, indicating that there is no clear improvement in this regard. For the share of renewable energy in total energy consumption, the values fluctuate over time. The variations are relatively small, with an average of 24.4% of the energy used being renewable, peaking at 25% in 2016 and dropping to 23.6% in 2021. The only indicator that demonstrates improvement, albeit only after 2019 due to the impact of the pandemic, is the amount of waste generated. Data for this indicator are available only biennially, and for the intervening years without data, the previous year's value is considered.

For the second objective, which focuses on waste recycling, the municipal waste recycling rate was selected for analysis. According to **Figure 12**, Romania has not made significant progress in this area, with rates varying between 11% and 14%. The highest level was reached in 2017, at 13.98%, while the lowest was 11.07%, during the following year.

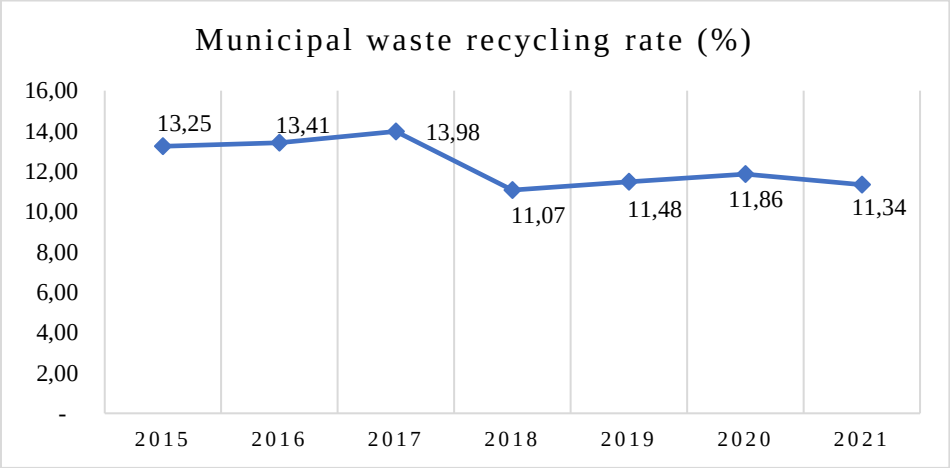

Figure 12. Selected indicators for target 3 of SDG 12 (line 13, Appendix 1).

Moving on to the third targeted segment, which is separate waste collection, we have chosen to graphically represent the total amount of municipal waste collected from 2015 to 2022. The total quantity of waste collected followed an upward trend throughout the analyzed period, with the exception of 2022, when there was a decrease of 0.5%. The average annual growth rate was 4.3%, increasing from just under 3,900 tons collected to over 4,900 tons collected (**Figure 13**).

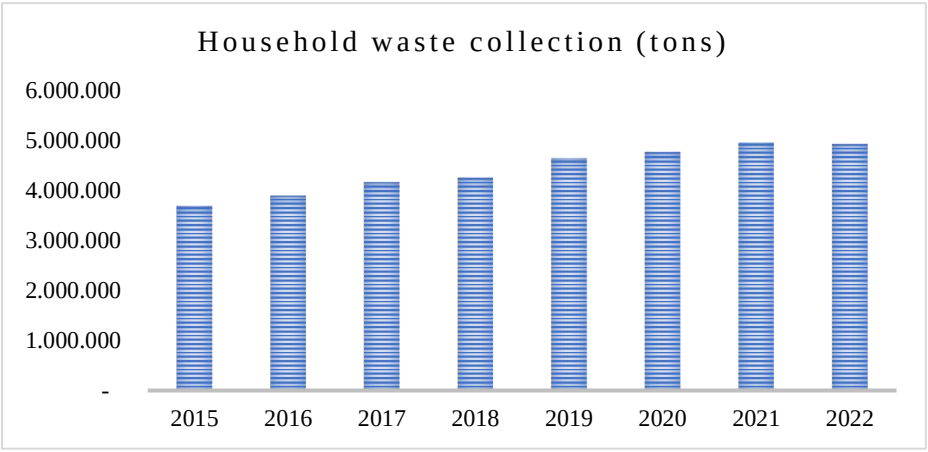

Figure 13. Selected indicators for target 5 of SDG 12 (line 14, Appendix 1).

Figure 14 shows the contribution to the environmental fund by economic operators for the packaging waste they have produced. This indicator pertains to the target of "establishing a mandatory extended producer responsibility scheme for all packaging by 2024." The graphical representation reveals significant fluctuations during the analyzed period. Specifically, extreme values are observed in consecutive years with large differences between them. For instance, the contribution in 2015 was 8.4 million RON, while in 2016 it exceeded 290 million RON. Between 2017 and 2019, the value averaged over 100 million RON, whereas in the last three years analyzed, the average was below 35.5 million RON. Thus, there is no clear upward trend in this contribution, and consequently, no higher taxation on the use of packaging.

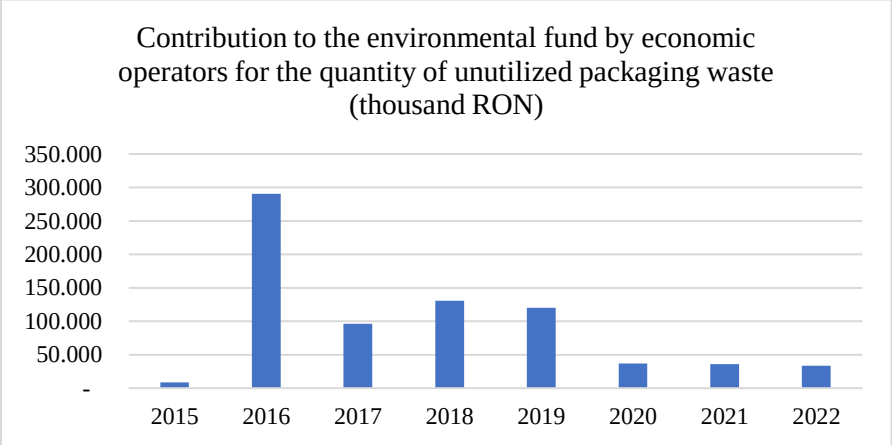

Figure 14. Selected indicators for target 6 of SDG 12 (line 15, Appendix 1).

The final indicator (**Figure 15**) refers to the number of electric and hybrid vehicles in Romania from 2015 to 2023. This indicator is related to the goal of implementing green procurement and using renewable energy. The trend for the fleet of electric and hybrid vehicles is very positive, with consistent growth, especially after 2019. The majority is accounted for by hybrid vehicles, which reach nearly 185,000 units in 2023. Electric vehicles also achieve a significant level, exceeding 42,000 units in 2023, with the two categories combined totaling over 200,000 units.

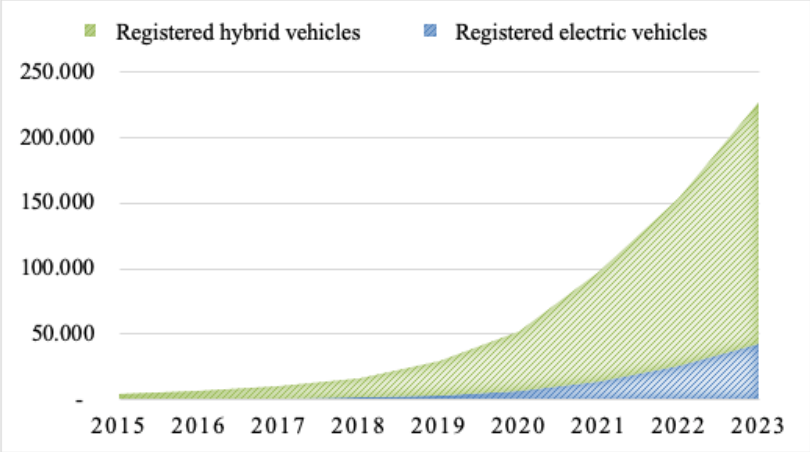

Figure 15. Selected indicators for target 7 of SDG 12 (line 16, Appendix 1).

5. Conclusions

The analysis of the nine selected indicators for **SDG 8 (Decent Work and Economic Growth)** reveals generally positive trends for Romania during the period from 2015 to 2021. Most indicators align with the country's development targets, reflecting progress in areas such as economic growth and labor market improvements. However, a notable exception is the declining share of GDP invested in small and medium-sized enterprises (SMEs), which poses a challenge to sustaining long-term economic development and innovation within this crucial sector.

In contrast, the indicators for **SDG 9 (Industry, Innovation, and Infrastructure)** paint a less optimistic picture. Key areas, such as road safety and access to finance for SMEs, have not met expectations. Additionally, both research and development (R&D) expenditures and environmental expenditures as a share of GDP have been insufficient, and the trend in greenhouse gas emissions

remains concerning. However, there are positive developments, particularly in the growth of value-added environmental technologies and an increase in the number of researchers per million inhabitants. These areas demonstrate potential for future progress if adequately supported by policy and investment.

For **SDG 10 (Reduced Inequalities)**, the overall trends are similarly mixed. While some progress has been made in reducing infant mortality and poverty risks, other indicators, such as income inequality and social inclusion, reflect stagnation or even regression. This suggests that Romania still faces significant challenges in addressing social disparities and creating a more inclusive society.

Regarding **SDG 12 (Responsible Consumption and Production)**, Romania has made strides in areas like the collection of municipal waste and the adoption of electric and hybrid vehicles, which are positive steps towards environmental sustainability. However, other key indicators show fluctuations or negative trends, indicating inconsistent progress. This suggests that Romania's efforts in sustainable consumption and production have not yet reached the levels necessary to significantly impact its environmental footprint.

In summary, Romania has shown measurable progress across some of the selected SDGs, but gaps remain, particularly in areas requiring greater investment and systemic change. To accelerate progress towards the 2030 Sustainable Development Goals, Romania will need to strengthen its focus on innovation, research, and environmental sustainability while addressing social inequalities and improving support for SMEs.

Appendix 1. Selected indicators for key sustainable development objectives in Romania: a focus on economic growth, innovation, inequality and sustainability

LINE	SDG	TARGET AREA	SELECTED INDICATOR
1	**SDG 8**	1. Maintaining a GDP growth rate higher than the EU average to support efforts to reduce disparities compared to advanced European countries, while applying sustainable development principles and continuously improving the living standards of the population	TIL0811 - Target 1 - Economic - Gross National Income per capita TIN0813 - Target 1 - Economic - ANNUAL GDP GROWTH RATE PER CAPITA
2	**SDG 8**	2. Promoting development-oriented policies that support productive activities, the creation of decent jobs, entrepreneurship through start-ups, creativity and innovation, and encourage the formalization and growth of micro, small, and medium-sized enterprises, including through access to financial services	TIP0821 - Target 2 - Economic - PERCENTAGE OF GDP ALLOCATED TO SME INVESTMENTS TIQ0822 - Target 2 - Economic - ADDED VALUE GENERATED BY SMEs AS A SHARE OF GDP TIU0826 - Target 2 - Social - UNEMPLOYMENT RATE BY SEX AND TOTAL
3	**SDG 8**	3. Achieving higher productivity levels through diversification, technological modernization, and innovation, with a focus on high value-added sectors and intensive labour use	TJC0831 - Target 3 - Economic - LABOR PRODUCTIVITY GROWTH RATE PER PERSON EMPLOYED TJD0832 - Target 3 - Economic - AVERAGE NET MONTHLY SALARY IN RESEARCH AND DEVELOPMENT ACTIVITIES IN ENTERPRISES TJE0833 - Target 3 - Economic - VALUE OF EXPORTS AND IMPORTS OF GOODS BY COMPANIES WITH FULL ROMANIAN CAPITAL
4	**SDG 8**	4. Developing long-term competitive tourism, promoting agritourism, ecotourism, rural tourism, spa tourism, and cultural tourism, and improving Romania's image as a tourist destination	TJI0842 - Target 4 - Economic - TOURIST ACCOMMODATION STRUCTURES BY TYPE
5	**SDG 9**	2. Improving road safety	TJV0921 - Target 2 - Social - ROAD TRAFFIC FATALITY RATE PER 100,000 INHABITANTS TJW0922 - Target 2 - Social - Number of road accidents, by location (motorways, in settlements, outside settlements)
6	**SDG 9**	3. Revitalizing industries to become sustainable, with increased resource efficiency and greater adoption of clean and green industrial technologies and processes, with all countries taking measures according to their respective capacities	TKA0931 - Target 3 - Environment - VALUE OF PRODUCTION AND ADDED VALUE IN ENVIRONMENTAL TECHNOLOGIES TKE0935 - Target 3 - Environment - GREENHOUSE GAS EMISSIONS BY ECONOMIC ACTIVITIES TKF0936 - Target 3 - Environment - ENVIRONMENTAL PROTECTION EXPENDITURES AS A PERCENTAGE OF GDP
7	**SDG 9**	5. Strengthening scientific research, modernizing the technological capacities of industrial sectors; encouraging innovation and significantly increasing the number of employees in research and development, and increasing public and private expenditures on research and development	TKM0951 - Target 5 - Economic - RESEARCHERS IN RESEARCH AND DEVELOPMENT ACTIVITIES PER MILLION INHABITANTS TKO0953 - Target 5 - Economic - TOTAL EXPENDITURES ON RESEARCH AND DEVELOPMENT ACTIVITIES IN THE PUBLIC SECTOR AS A PERCENTAGE OF GDP

LINE	SDG	TARGET AREA	SELECTED INDICATOR
8	**SDG 9**	7. Increasing access for small and medium-sized enterprises to financial services, including affordable credit, and integrating them into value chains and external markets	TKT0971 - Target 7 - Economic - BALANCE OF FOREIGN TRADE OPERATIONS CARRIED OUT BY SMEs
9	**SDG 10**	1. Adopting policies, especially fiscal, wage, and social protection policies, to progressively reduce inequalities, particularly the proportion of disadvantaged groups	TKZ1012 - Target 1 - Social - INCOME INEQUALITY INDEX TLB1014 - Target 1 - Social - GINI COEFFICIENT TLH1019 - Target 1 - Social - RATE OF NEET (Not in Education, Employment, or Training) YOUTH
10	**SDG 10**	2. Aligning Romania with the EU average level by 2030 in terms of sustainable development indicators	TBC0231 - Target 2 - Social - INFANT MORTALITY RATE TGV0651 - Target 2 - Social - RISK OF POVERTY OR SOCIAL EXCLUSION RATE (AROPE - new definition) TLJ1031 - Target 2 - Environment - MUNICIPAL WASTE RECYCLING RATE
11	**SDG 10**	3. Reducing discrimination by supporting non-governmental organizations working in the field of human rights	TLM1034 - Target 3 - Social - NUMBER OF DISCRIMINATION FINDINGS AND THEIR SHARE IN THE TOTAL ANNUAL DISCRIMINATION COMPLAINTS RECEIVED BY CNCD
12	**SDG 12**	1. Gradual transition to a new development model based on the rational and responsible use of resources, introducing elements of the circular economy, and developing a roadmap	TMW1211 - Target 1 - Environment - DOMESTIC MATERIAL CONSUMPTION, INCLUDING BIOMASS TNA1211 - Target 1 - Environment - QUANTITY OF WASTE GENERATED TNB1212 - Target 1 - Environment - SHARE OF RENEWABLE ENERGY IN GROSS FINAL ENERGY CONSUMPTION BY SECTORS
13	**SDG 12**	3. Recycling 55% of municipal waste by 2025 and 60% by 2030	TNQ1231 - Target 3 - Environment - MUNICIPAL WASTE RECYCLING RATE, BY TYPE OF OPERATION
14	**SDG 12**	5. Separate collection of hazardous municipal waste by 2022, biological waste by 2023, and textile materials by 2025	TNX1252 - Target 5 - Environment - QUANTITY OF MUNICIPAL WASTE COLLECTED, BY CATEGORY
15	**SDG 12**	6. Establishing mandatory extended producer responsibility schemes for all packaging by 2024	TOB1262 - Target 6 - Environment - CONTRIBUTION TO THE ENVIRONMENTAL FUND BY ECONOMIC OPERATORS FOR UNRECOVERED PACKAGING WASTE
16	**SDG 12**	7. Implementing sustainable green public procurement practices, in line with national priorities and European policies	TOF1272 - Target 7 - Environment - NUMBER OF REGISTERED ELECTRIC AND HYBRID VEHICLES

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