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Article — Published Version

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Theoretical and Applied Economics

Suggested Citation: Tudorache, Maria-Daniela; Jianu, Ionut (2025) : Monitoring the implementation of the Sustainable Development Goals in Romania, Theoretical and Applied Economics, ISSN 1844-0029, Theoretical and Applied Economics, Bucharest, Romania, Vol. XXXII, Iss. 3(644), pp. 217-238,
<https://store.ectap.ro/articole/1861.pdf>

This Version is available at:

<https://hdl.handle.net/10419/327136>

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Monitoring the implementation of the Sustainable Development Goals in Romania

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Abstract. *This paper aims to assess the implementation of the Sustainable Development Goals in Romania in the context of the EU-27 membership. To achieve this, we used specific indicators for all 17 SDGs and we performed a comparative and time-series analysis to identify the current social, economic and environmental challenges that Romania is facing. Our results show that socio-economic challenges are more pressing than environmental ones, compared to other developed EU MS where the environmental challenges needs an increased focus within the policy specific processes.*

Keywords: Sustainable Development Goals, poverty, inequality, institutions, education.

JEL Classification: I25, I30, O11, Q01, Q50.

1. Introduction

The European Union emerged as a result of the need for economic recovery after the Second World War. In this case, in 1957, six countries - Belgium, France, Italy, the Netherlands and West Germany signed the Treaty of Rome, which created the European Economic Community. After establishing this community, the first objectives set in terms of development were: (i) ensuring economic and social progress by eliminating trade barriers; (ii) increasing trade relations, by promoting a common trade policy; (iii) improving working conditions and, implicitly, living conditions; (iv) respecting the United Nations principles regarding peace and international cooperation, in order to solve issues in economic, social, cultural and human field; (v) reducing regional disparities from an economic and social point of view.

Later, with the enlargement of the EU and the emergence of more global challenges, the European institutions developed and adopted the Lisbon Strategy, which stipulated that economic development must promote sustainable economic growth, and must take into account environmental protection policy. The challenges to which EU has been exposed, namely social imbalances, and ageing population, economic pressures in terms of global competition, increase the need to focus the EU policy efforts on sustainable economic growth, creating jobs, ensuring social security and better environmental protection.

In 2016, through the Paris Agreement, the EU adopted the first global climate change agreement, the UN's 2030 Agenda. In 2015, UN adopted the 2030 Agenda for Sustainable Development, which aims to support ensuring prosperity for people worldwide. This agenda includes 17 Sustainable Development Goals (SDGs), which are intended to provide an urgent response from all states through a global partnership. According to the UN, eradicating poverty, reducing inequalities, improving education and health systems, and boosting economic growth must be in line with mitigating climate change. In order to ensure sustainable development, it is necessary to achieve all SDGs simultaneously.

With the intensification of discussions at the level of working groups organized at the level of the Council of the European Union and at the level of the European Commission regarding the Paris Agreement, member states have begun to attach increasing importance to the sustainable development goals developed by the United Nations. In this context, the objective of this paper is to analyse the evolution of all SDGs (focusing on specific indicators) in Romania in the last decade.

2. Literature review

According to Acemoglu and Robinson (2012), institutions are a key factor of prosperity within countries. Institutions have the role of ensuring good governance, corruption control, regulations and a well-functioning rule of law (Alkhamery et al., 2021, Jianu et al., 2025). In this case, Nandha and Smyth (2013) demonstrated that, in 186 states, during the period 1995-2011, the quality of institutions had a significant impact on human well-being and economic development.

The reduction of poverty has become a priority, but there is no international consensus on its measurement (Sapena et al., 2018). From an economic perspective, poverty occurs when a family's income falls below a specific established threshold. Despite significant progress in eradicating poverty and promoting human well-being in recent decades, extreme poverty and inequalities are still widespread in developing countries. According to Sachs (2005), poor countries are stuck in a poverty trap from which they cannot escape without a boost from developed countries, while Easterly (2006) suggests that poverty is a cause of poor governance. Furthermore, poverty is not only a cause of lack of income, but also reflects poor health, poor education and a poor quality of life (Duflo and Banerjee, 2011; Tudorache, 2019; Tudorache, 2022).

Addressing global hunger challenges is another important objective that requires annual investments in agricultural research and development, agricultural expansion services, agricultural information systems, the expansion of irrigation and improving the literacy rate (Chichaibelu et al., 2021). Hoddinott et al. (2013) state that, in order to reduce hunger, an acceleration of yield growth, an increase in fertilizers, respectively, intervention to reduce micronutrient deficiencies (vitamin A, iodine, iron, zinc) are needed.

In terms of life expectancy and infant mortality, some progress has been recorded globally in the last two decades, the number of deaths caused by malaria being reduced to its half (World Health Organization, 2018). However, the progress has been modest and uneven, both between and within countries (Mohammed and Ghebreyesus, 2018): some countries, especially developed ones, have made progress in the field of health, while underdeveloped and developing countries still face deficiencies in their health systems. On the other hand, high prosperity around the world, changes in diet, lifestyle, along with rapid and unplanned urbanization have led to new health threats for the population. Besides that, the incidence of chronic respiratory diseases, diabetes and various forms of cancer is on an increasing trend (World Health Organization, 2017). Transformative change in cities is needed to address current and future challenges to health and sustainability (Steffen, 2018). Also, Crane et al. 2021 state that cities need international research partnerships, namely complex urban systems for sustainability and health, these being important aspects for shaping policy decisions and their implementation in urban communities.

According to UNESCO (2000), quality education occurs when the learning outcomes are measurable and recognized for all individuals. Unfortunately, there is no definition, list of criteria or a uniformly accepted curriculum that presents what quality education should include. Education is a dynamic concept that changes and evolves over time, depending on the social, economic and environmental context (UNESCO, 2005), with the ability to adapt to the labour market demands playing an important role.

Decent work is an aspirational statement about the quality of work that should be available to all who want to work. The labour market is undergoing various transformations, and working conditions are governed by market forces, which create instability and insecurity, causing increased levels of stress and anxiety for the workforce (Stiglitz, 2015; Piketty, 2014). Millions of workers around the world earn the minimum wage, a challenge that is addressed by reducing or limiting the inequality of wage distribution, respectively by

reducing the gender pay gap, since women tend to obtain lower wages than men (Belser and Rani, 2015).

The last half century has seen the emergence of the so-called concept “gender revolution”, which promoted the increase in the number of women pursuing university studies (DiPrete and Buchmann, 2013), the employment rate among women - including women with young children (Cotter et al., 2007). Moreover, equal opportunities in employment have emerged in the personnel policies of organizations (Dobbin, 2009), with women being able to occupy jobs and managerial positions that were previously occupied only by men (Weeden, 2018). In addition, wage gap have decreased significantly after 1980 in the European Union, but in other countries, such as the United States, it remained high (Blau and Kahn, 2017).

The COVID-19 pandemic has affected the progress achieved on gender equality, through the channel of the increased violence against women and through the one of increased domestic work for women. The pandemic has also highlighted the need for rapid action to address gender inequality, which remains widespread globally, even if women have played a key role in managing the health sector crisis, since the workforce in this sector is predominantly female.

Climate changes challenges are also reflected in sustainable development goals. In particular, these are reflected in temperature changes in a given region (McMichael et. al, 2006). In recent decades, the temperature has increased by 0.5 degrees Celsius due to greenhouse gas emissions (Trenbert, 2001). The increase in temperatures is associated with the melting of ice caps, the sinking of coastal areas, and floods and droughts in certain regions (Solomon et al., 2007). At global level, climate change can affect humanity, with developing countries being the most exposed to the risks (Mendelsohn et al., 2006), the effects being directly observable through the wildfires that have increased in recent times.

Atmospheric concentrations of greenhouse gas emissions have continued to rise, the period 2015-2024 being considered the warmest in history. In order to limit global warming, in accordance with the Paris Agreement, greenhouse gas emissions must reach 1990 levels by 2050. According to UN climate action reports, global emissions must be reduced by 45% below 2010 levels by 2030 to limit global warming. Fossil fuels (coal, oil, natural gas) have led to increased greenhouse gas emissions, which necessitates increased renewable energy production (Zabeltitz, 1994). The main objective of large-scale renewable energy deployment is to promote economic development, improve energy access, and mitigate climate change (Kumar and Majid, 2020). There have been improvements in access to electricity and renewable energy over the past decade, but these have been ineffective in providing affordable energy for all. In the early stages of the ecological transition, the costs appear to be quite high, especially in countries with high poverty rates, this reflecting a potential trade-off in these countries.

Additionally, human-caused damage, together with climate change, is threatening the well-being of the oceans and the water creatures (Sturesson et al., 2018). In this case, collective action and government involvement are needed to address the challenges of marine pollution (IASS, 2017). Increased interest in ocean science will lead to increased

investment in marine research to counter the damage caused by climate change (ECESA, 2017). Oceans, seas and marine resources are under threat from pollution and global warming that are disrupting ecosystems around the world. The challenges advanced by climate change create long-term repercussions, requiring investment in ocean science, environmental protection, support for small fishing communities and sustainable ocean management, especially given that approximately three billion people rely on the ocean for their livelihoods and 80% of global trade is freight transport.

Regarding the natural resources, water makes up more than two-thirds of the human body, being a vital component for any form of life. Most of the time, clean water is not accessible to human beings in particular countries or regions, this affecting the individual's health status (Khalifa and Bidaisee, 2018). There are several factors that contribute to ensuring the accessibility of clean water, including physical, demographic, geopolitical and socio-economic status (World Vision). Physically, water sources are difficult to access due to topographical factors and climatic circumstances. Demographically, location can affect the accessibility of clean water, as a result of problems related to overpopulation. Geopolitically, due to water obtained in the river flow, people downstream rely on people upstream to maintain the purity of the water. Finally, socio-economic status will have implications on the accessibility of clean water.

Forests, especially tropical forests, are known for their biological complexity, given their diverse species density and variety of biological interactions (Kricher, 1997). Deforestation and forest degradation have consequences for human well-being and survival. While efforts are being made to expand sustainable forest management and adopt biodiversity coverage, and to protect biodiversity and oceans through legislation and treaties, additional efforts are needed to protect the planet.

Moreover, responsible consumption and production are essential for a sustainable society. Human and environmental systems interact through the economic system in various ways, which has led to the emergence of several complex, intractable, conflictual and multidimensional problems that can be countered with the help of tools to manage consumption and production problems (Churchman, 1967). Therefore, sustainable production and consumption focus on different elements of the supply chain: from extractive industries to individual supply needs (Tseng et al., 2018). In this case, green supply chains and green consumerism are necessary to achieve progress in sustainable consumption and production.

Industrial companies are currently facing challenges due to globalization, rapid changes in the structure of demand and supply, and technological innovation. As a result of these changes, organizations are forced to act quickly and intelligently to changes in order to increase their competitiveness (Davenport, 2014). In addition, the integration of digital and intelligent technologies has allowed companies to find the most appropriate way to operate (Zhou, 2013). However, the volatility and uncertainty caused by technological changes are not conducive to economic development, as they create excesses and support the increase in the degree of economic division. The pandemic, together with tariff and trade tensions, have strongly affected the manufacturing industry and transportation, causing significant job losses and a decrease in the income of workers in these sectors.

3. Methodology

This paper analyses the implementation of the Sustainable Development Goals in Romania in the context of the EU-27 membership. In this respect, we selected relevant indicators (extracted from Eurostat) for the 17 SDGs, as follows:

- SDG 1 - eradication of poverty: people at risk of poverty or social exclusion (%) and in-work at-risk-of-poverty rate (%);
- SDG 2 - eliminating hunger: area under organic farming (% of utilised agricultural area) and government support for agricultural research and development (EUR per inhabitant);
- SDG 3 - ensuring good health and well-being: healthy life years at birth (years);
- SDG 4 - improving quality of education: early leavers from education and training (18-24 years) rate (%) and the percentage of population aged between 16-74 having at least basic digital skills.
- SDG 5 - ensuring gender equality: gender pay gap (difference between average gross hourly earnings of male and female employees, as % of average gross hourly earnings of men) and gender employment gap (difference between the employment rate of men and women aged 20-64, percentage points);
- SDG 6 - ensuring clean water and sanitation: people having neither a bath, nor a shower, nor indoor flushing toilet in their household (% of population) and population connected to at least secondary wastewater treatment systems (% of population);
- SDG 7 - ensuring affordable and clean energy: renewable energy (% of gross final energy consumption) and energy import dependency (% of total energy consumption);
- SDG 8 - ensuring decent work and economic growth: Real GDP per capita (EUR per capita, base year 2020) and young people neither in employment nor in education and training (NEET) rate (% of the population aged between 15-29 years);
- SDG 9 - strengthening industry, innovation and infrastructure: R&D expenditure (% of GDP);
- SDG 10 - reducing inequalities: income share of the bottom 40% of the population (% of income);
- SDG 11 - improving the sustainability of cities and communities: recycling rate of municipal waste (% of total municipal waste generated);
- SDG 12 - ensuring responsible consumption and production: circular material use rate (% of material input for domestic use);
- SDG 13 - adopting appropriate climate action measures: net greenhouse gas emissions (tonnes per capita) and average CO₂ emissions per km from new passenger cars (grams of CO₂ per km);
- SDG 14 - protecting marine areas: surface of marine protected areas (% of marine areas);
- SDG 15 - protecting land areas: surface of terrestrial protected areas (% of total land area);
- SDG 16 - promoting peace, justice and strong institutions: perceived independence of the justice system (% of the total population) and corruption perception index (0 highly corrupt to 100 absence of corruption);

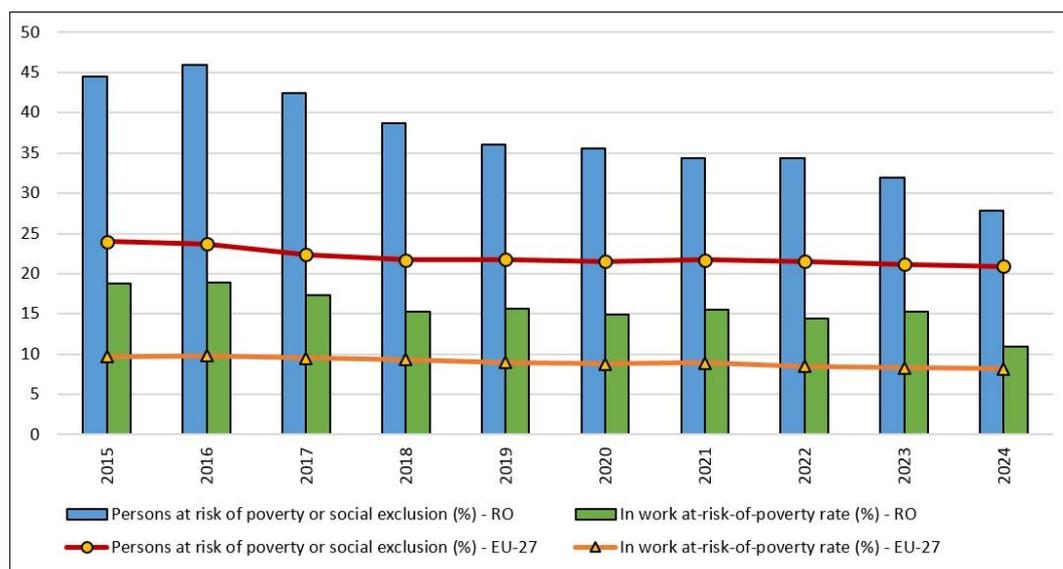
- SDG 17 - promoting partnership for the goals: official development assistance provided (% of gross national income);

However, when drafting the analysis, we followed a parsimonious approach, while not using all specific indicators and only the most relevant ones. Therefore, we did not use the order of the SDGs presented by the United Nations and Eurostat (above), since we grouped some of the selected indicators according to their links to allow their combination in specific charts. In this respect, our analysis was based on four types of chart analyses and one statistical method to measure the association between variables, as follows: (i) post-2009 crisis yearly analysis (depending on the availability of the data) for Romania using the last available year as ending point of the analysed time series; (ii) comparative analysis between Romania and other EU MS using data for the last available year; (iii) comparative analysis between Romania and other EU MS using data for the last available year and the last available year minus ten years; (iv) scatter plot analysis to examine the relationship between variables; (v) correlation coefficients to examine the association between variables. It should be noted that if some data were missing for a maximum of 3 countries (but these were available for a previous year), in these cases, we used data for the last year available (with a limit of 2 year lag).

4. Results and interpretations

In this section, we analysed specific indicators for all SDGs in the case of Romania. In *Figure 1* we analysed the people at risk of poverty or social exclusion and in work at-risk-of-poverty rate in the period 2015-2024.

Figure 1. *People at risk of poverty or social exclusion rate vs. in work at-risk-of-poverty rate in Romania (2015-2024)*

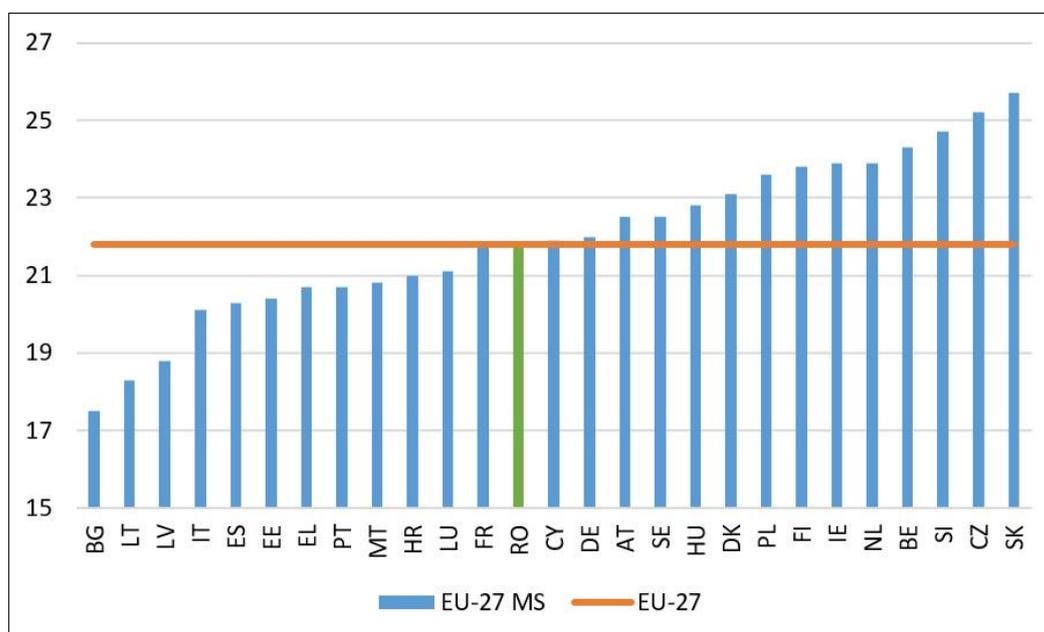


Source: Own processings in Microsoft Office Excel based on Eurostat data

Despite the fact that the people at risk of poverty or social exclusion was on a decreasing trend during the analysed period, in 2024, Romania registered the second highest poverty rate in the EU Member States (27.9%) – in first place was BG (30.3%), above the EU average (21%). Also, the social situation does not improve when examining the in work at-risk-of-poverty rate, as Romania recorded the fourth highest value of this indicator (10.9%) among EU countries, after LU (13.4%), BG (11.8%) and ES (11.2%), considering the EU rate of 8.2%. Therefore, government authorities must continue to adopt policies to reduce the poverty rate, especially in less developed regions.

The social risks are also reflected in indicators related to income inequality, another important objective that United Nations propose it as a policy priority worldwide. According to the data presented in *Figure 2*, Romania registered an average income inequality in 2024, a similar value to the one found in the case of EU.

Figure 2. *Income share of the bottom 40 % of the population (2024)*



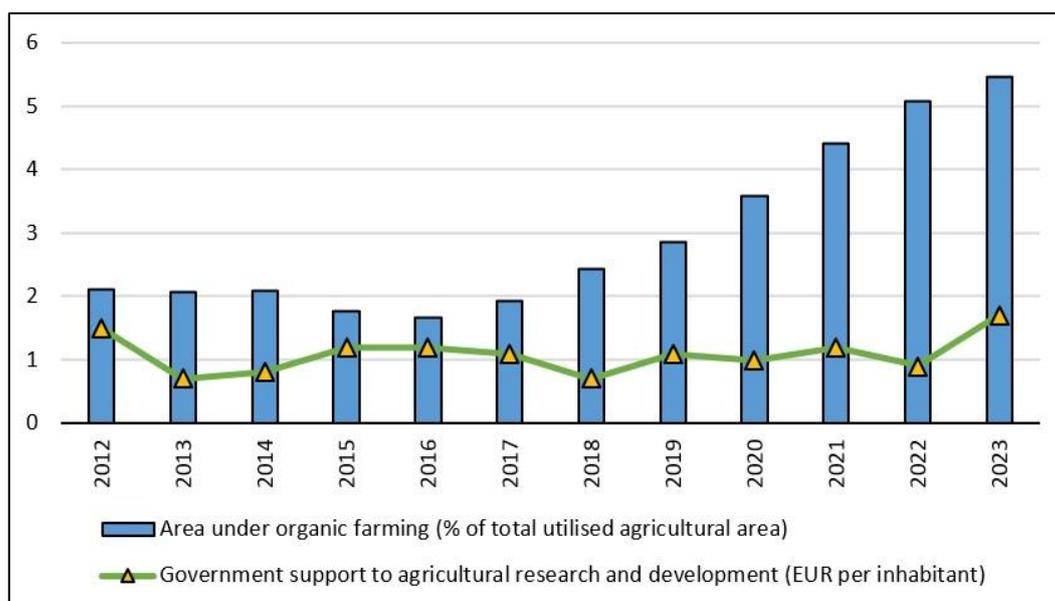
Source: *Own processings in Microsoft Office Excel based on Eurostat data*

In this respect, Romania registered an income share of the bottom 40% of the population of 21.8%, this being lower than the levels registered in 14 Member States (CY, DE, AT, SE, HU, DK, PL, FI, IE, NL, BE, SI, CZ and SK). However, it should be taken into account the limits of this indicator, since it does not sufficiently surprise the income gap among individuals, as the gap may be higher in the case of the bottom 10% or 20% and may be diminished when taking into account an extended overview (bottom 40%). Nevertheless, the Gini coefficient has been adjusted with 5.8 points in Romania (to a lower value) after COVID-19 crisis, which reflects a significant drop of income inequality – this confirming a reduction in this imbalance, even if this remains a serious challenge taking into account its positive association with poverty risks.

Regarding the goal of eradicating hunger, we analysed the evolution of area under organic farming and the government support to agricultural research and development. *Figure 3* shows that during the period 2012-2023 the area under organic farming increased in Romania, but still remain at a low level compared to its potential. The Member States that recorded lower values than RO (5.08%) for this indicator in 2023 was MT (0.6%), IE (2.2%), BG (2.2%), PL (3.91) and NL (4.44%). At the opposite, the countries with the highest values in 2023 were EE (23.42%), SE (19.94%) and PT (19.31%).

Also, the government support to agricultural research and development in RO was very low in 2023 (1.7 euro per inhabitant), even if it overpasses the support granted in PL (0.2 euro per inhabitant) and LU (0.8 euro per inhabitant). RO is considered a country with high agricultural potential, but government allocations remain modest throughout the analysed period, which limits its potential. In this case, funding for organic agriculture should be increased, research systems related to crop cultivation should be further developed, and irrigation should be expanded.

Figure 3. The evolution of area under organic farming (% of total utilised agricultural area) and of the government support to agricultural research and development (EUR per inhabitant) in Romania (2012-2023)

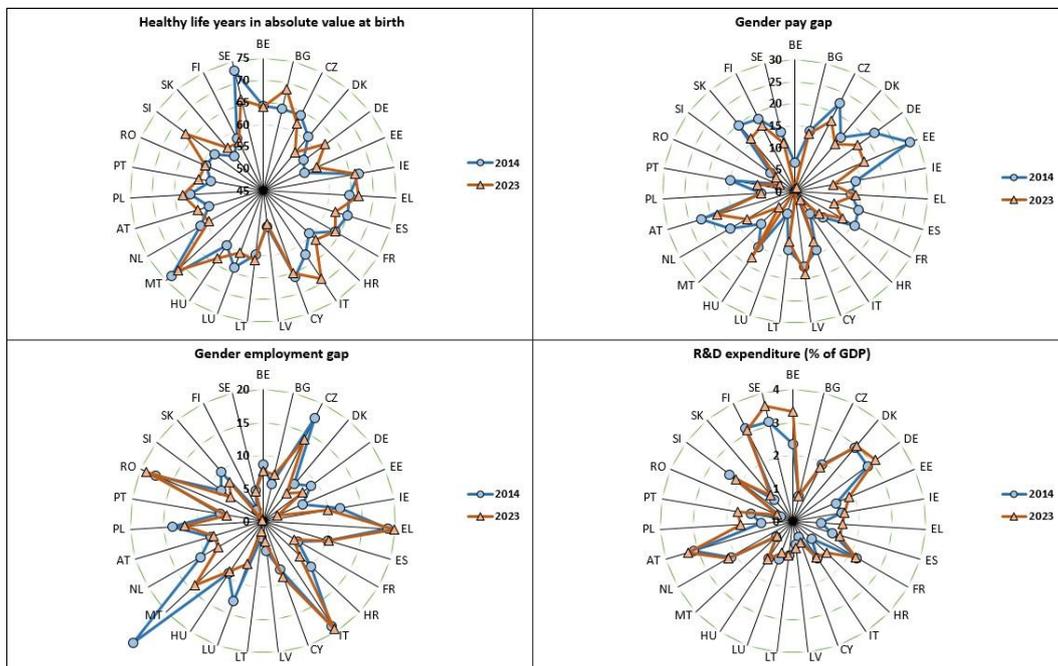


Source: Own processings in Microsoft Office Excel based on Eurostat data

Next, we selected four indicators (healthy life expectancy, gender pay and gender employment gap, and R&D expenditure as a % of GDP) to catch the progress in the implementation of three SDGs (gender equality, good health and well-being, respectively industry, innovation and infrastructure) over the period 2014-2023 in EU Member States (*Figure 4*). The data shows that the highest healthy life expectancy in 2023 has been found in MT (71.4 years), IT (69.1 years) and BG (68.6 years). Over the period 2014-2023, in the case of 14 MS, the healthy life expectancy increased (RO⁽¹⁾, LT, PL, EL, HR, SK, AT, PT, EE, HU, BG, DE, IT, SI), in 1 MS remained constant (FR), while for 12 MS it decreased

(BE, LV, IE, CY, FI, MT, CZ, NL, ES, LU, DK, SE). The graph shows that the highest increases were recorded in DE (+6 years), IT (+6.7 years) and SI (+7.9 years), while the largest drops were found in LU (-3.6 years), DK (-4.6 years) and SE (-6.7 years). However, it should be taken into account that this indicator is based on a survey, and, usually, in developed Member States, people tend to make more reports on health issues than those living in poorer countries. In this respect, when setting policy priorities and adopting new policy measures, the interpretation of this indicator should be limited to the self-perceived health and more focus should be emphasized on total life expectancy, which reflects additional challenges for Romania.

Figure 4. Healthy life expectancy, gender inequality and innovation in EU Member States



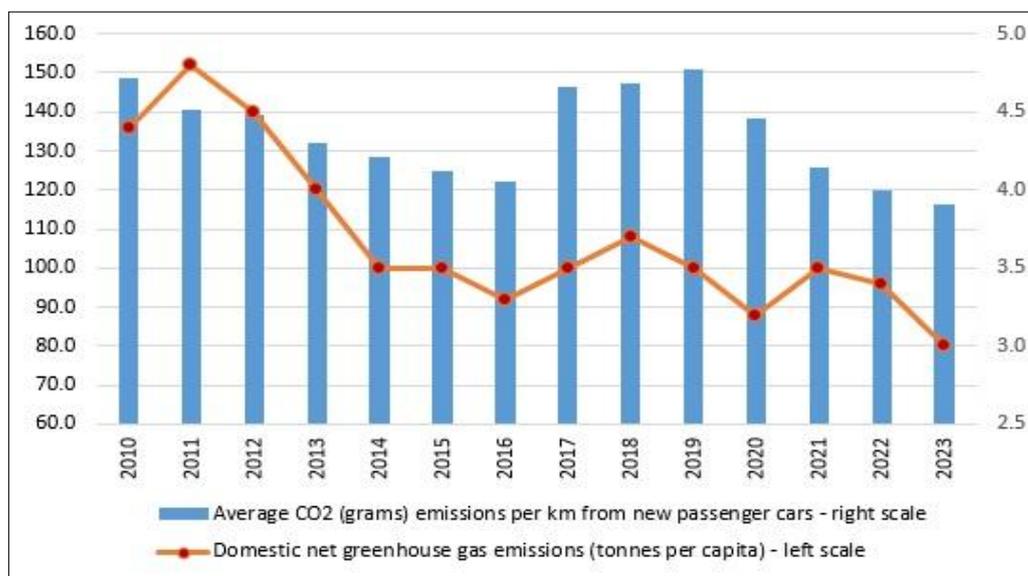
Source: Own processings in Microsoft Office Excel based on Eurostat data

With a view to gender gap, the data indicate a modest increase in gender pay inequality in the case of 4 MS (PL, EL, LV and HU), while the other MS experienced reductions in this imbalance, the largest falls being recorded in PT (-6.3pp), LU (-6.3pp) and EE (-11.2pp). In 2023, Romania registered the fourth lowest gender pay gap (3.8%) of EU, while the highest levels were reported for LV (19%), AT (18.3%) and HU (17.8%). *Figure 4* also highlights that only 6 MS (ES, IT, EL, CY, BG, RO) experienced increases in the gender employment gap, for Romania being reported the highest increase (1.6pp), while the largest falls were found in the case of EE (-4.1pp), LU (-6.1pp) and MT (-12.7pp). According to the data reported for 2023, Romania registered the third highest level of gender employment gap (19.1pp, after EL with 19.8pp and IT with 19.5pp), which highlights the need to increase the policy efforts to tackle gender inequality, including the one related to employment.

Regarding the R&D expenditure (% of GDP), Romania registered a modest increase over the period 2014-2023 of 0.16pp of GDP, while HR (+0.62pp of GDP), EL (+0.64pp of GDP) and BE (+0.96pp of GDP) experienced the highest growths of EU. At the opposite are CZ (-0.11pp of GDP), LU (-0.21pp of GDP) and SI (-0.26pp of GDP) for which has been reported the highest decreases in this indicator. Even if Romania registered a modest increase, the challenges related to low financing of R&D sector remain at a higher level, taking into account that Romania still registers the lowest share in GDP of the R&D expenditure (0.52 of GDP - 2023 data), being overpassed by MT and CY (0.64% of GDP and 0.68% of GDP - which have a competitive advantage in tourism sector) and BG (0.79% of GDP).

Another relevant goal is the one related to climate action. *Figure 5* presents the positive relationship between average CO₂ (grams) emissions per km from new passenger cars and the domestic net greenhouse gas emissions (tonnes per capita) in Romania over the period 2010-2023, this being also reflected in the mid to high Pearson correlation coefficient (49.02%). *Table 1* shows that the relationship was positive in 22 Member States, the strongest links being found in NL (80.2%), AT (72.96%) and HU (70.48%), while the highest negative correlations were calculated for FI (-15.36%), SE (-48.09%) and LV (-60.56%). This suggest that for Romania, emissions from new cars remain an important factor driving the greenhouse gas emissions, which should be adequately taken into account when designing climate strategies. However, greenhouse gas emissions in Romania remain under the levels experienced by other Member States. In this respect, even if the climate goals are pressing worldwide, Romania has enough space to promote flexible policy approaches.

Figure 5. The relationship between average CO₂ (grams) emissions per km from new passenger cars and domestic net greenhouse gas emissions (tonnes per capita) in Romania (2010-2023)



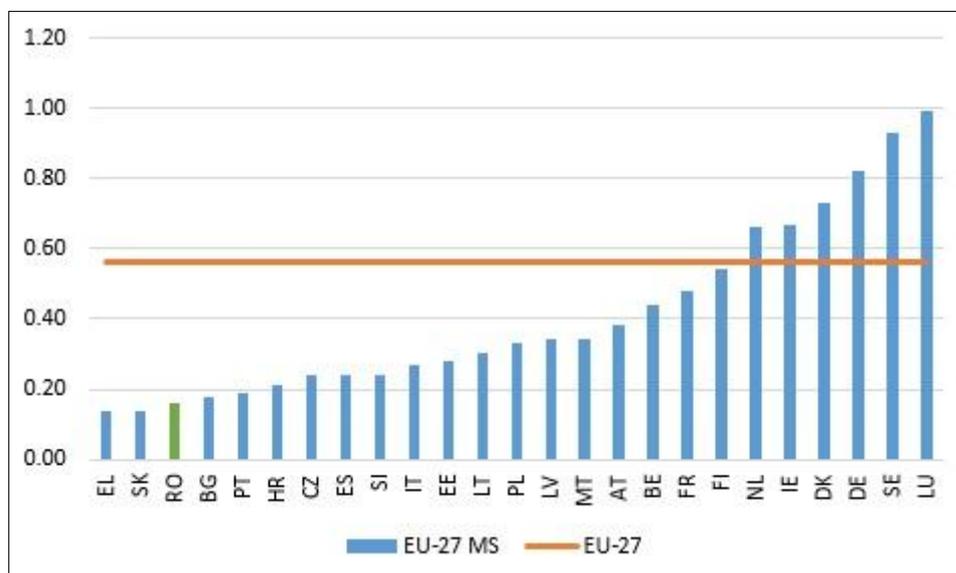
Source: Own processings in Microsoft Office Excel based on Eurostat data

Further, *in Figure 6*, to reflect the progress on implementing the goal entitled partnership for the goals, we analysed the official development assistance provided to developing countries. According to the Eurostat data, in 2023, Romania provided an assistance to developing countries equal to 0.16% of GNI, with 0,4pp lower than the EU value.

Table 1. Correlation between average CO₂ (grams) emissions per km from new passenger cars and domestic net greenhouse gas emissions (tonnes per capita) - 2010-2023

Correlation	Correlation
BE	57.11%
BG	-0.86%
CZ	39.65%
DK	59.32%
DE	58.19%
EE	27.76%
IE	61.09%
EL	19.08%
ES	19.40%
FR	54.97%
HR	41.40%
IT	6.93%
CY	28.33%
LV	-60.56%
LT	18.44%
LU	47.02%
HU	70.48%
MT	25.46%
NL	80.20%
AT	72.96%
PL	51.27%
PT	51.06%
RO	49.02%
SI	-10.96%
SK	32.33%
FI	-15.36%
SE	-48.09%

Source: Own processings in Microsoft Office Excel based on Eurostat data

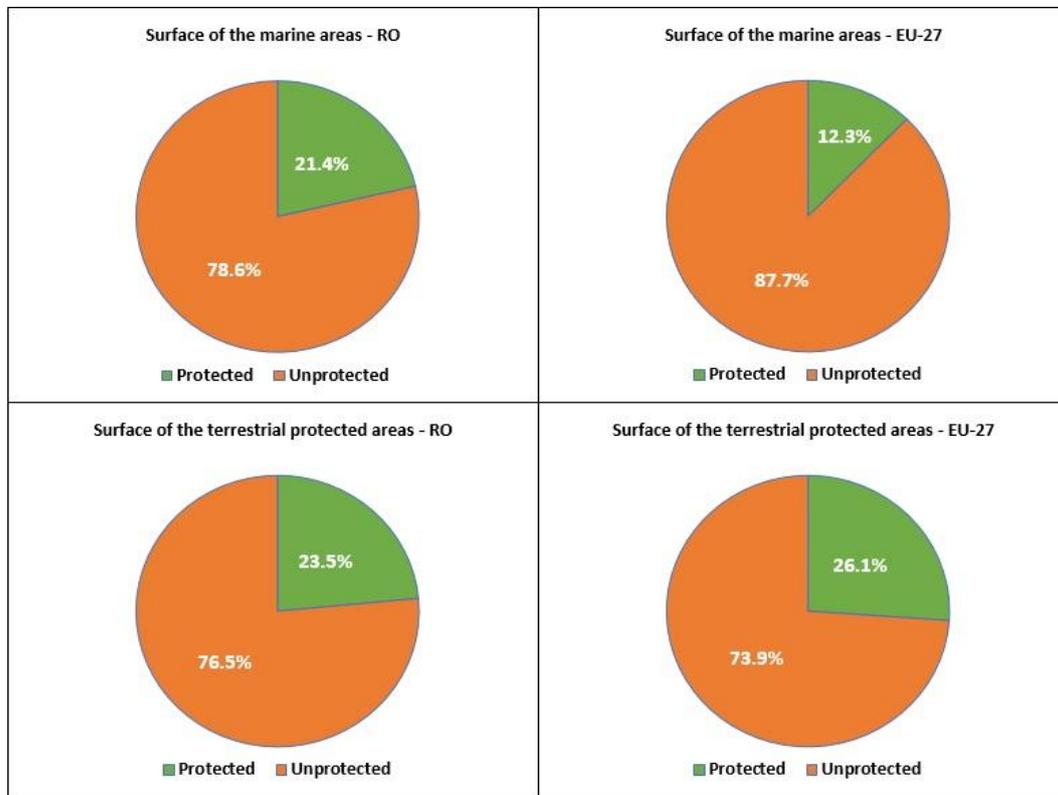
Figure 6. Official development assistance provided to developing countries (% of GNI) - 2023

Source: Own processings in Microsoft Office Excel based on Eurostat data

Although Romania is positioned under the EU value, it should be taken into account that only 6 developed EU MS registered a value over 0.56% of GNI, respectively NL (0.66%), IE (0.67%), DK (0.73%), DE (0.82%), SE (0.93%) and LU (0.99%). In this context, the data does not reflect a challenge for Romania, taking into account its development needs.

Regarding the SDGs entitled life below water and life on land, we conducted a comparison between Romania and EU-27 to examine the protected areas. In this respect, *Figure 7* indicates that 21.4% of the surface of the marine area is protected in Romania, compared to 12.3% reported for EU-27. Thus, Romania registered the seventh highest protected marine area from EU, and even if it has only 244 km of coastline, the Black Sea is ecologically valuable since it is one of the most important water areas of Europe.

However, it should be noted that EU-27 includes five landlocked countries (AT, CZ, HU, LU, SK) which reduces the EU value, while there are also countries with a longer coastline than Romania (IT, EL, ES) for which are reported a lower surface of marine protected areas taking into account the exploitation interests and local/regional fragmentation. With a view to the terrestrial protected areas, the difference between Romania (23.5%) and European Union (26.1%) is lower, but both rates are under the quantitative target (30% - also applicable for the marine areas) set through the Green Deal that should be reached until 2030. In the context of the European commitment, further efforts are needed at national level to reach this objective until 2030, but also to completely identify the 10% areas that should be strictly protected.

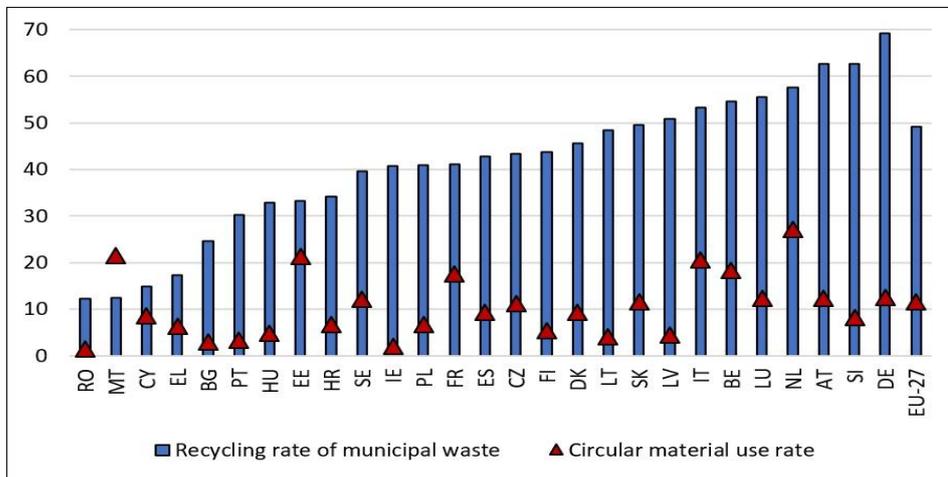
Figure 7. Surface of the marine and terrestrial protected areas - RO vs. EU-27 (2022)

Source: Own processings in Microsoft Office Excel based on Eurostat data

According to *Figure 8*, in 2022, the lowest value of the recycling rate of municipal has been recorded by Romania (12.3%, compared to the EU average of 49.1% - being followed by MT with 12.5% and CY with 14.8%), while the highest rates were found in AT (62.6%), SI (62.6%) and DE (69.2%). Regarding the circular materials use rate, Romania does not experience a better situation.

In 2022, RO (1.5%) registered the lowest value of this indicator, being followed by IE (2.1%) and BG (3%), while the EU average was 11.5%. The identified problems leading to low rates of recycling rate are the lack of selective waste collection containers (especially in rural areas), the lack of environmental education promoting the importance of selecting garbage. In order to reach the level of countries that consider recycling and circular economy essential, there is a need to promote investments in educating the population and those oriented to waste sorting process. In addition, the low circular material use rate may be attributable to the challenges related to poor infrastructure, dependence on primary resources and weak legislation in this area.

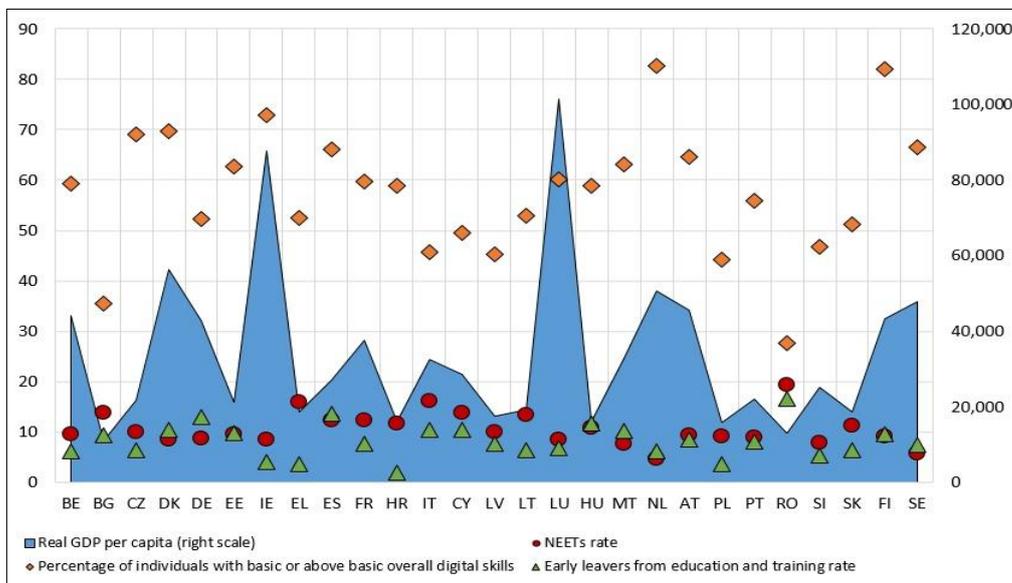
Figure 8. Recycling rate of municipal waste and circular material use rate in EU MS (2022)



Source: Own processings in Microsoft Office Excel based on Eurostat data

In Figure 9, we examined the EU-27 data for 2023 regarding the following indicators: real GDP per capita, percentage of individuals with basic or above basic overall digital skills, NEETs rate and early leavers from education and training rate. In this respect, according to the data, countries registering a low level of NEETs rate and early leavers from education and training rate seems to report a higher real GDP per capita, which evidences a positive relationship between economic growth and education level.

Figure 9. Economy and education quality data in EU MS (2023)



Note: the indicators expressed in % are represented on the left scale.

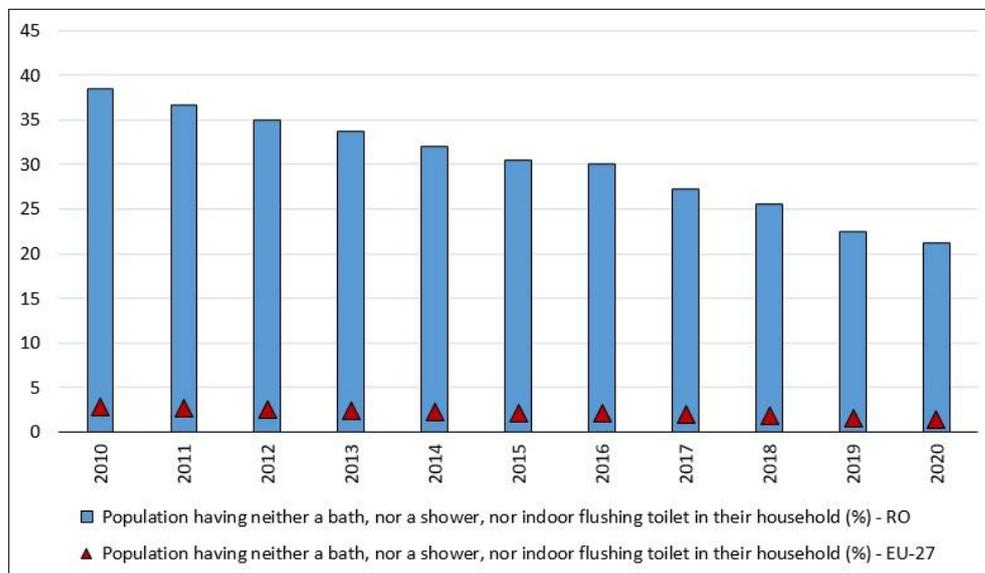
Source: Own processings in Microsoft Office Excel based on Eurostat data

People who for various reasons decide not to pursue an education or vocational qualification program will have more difficulty finding a job compared to those who have completed higher education. It should also be noted that they are exposed to income risks, compared to skilled and educated workforce.

Digital skills are also very important when discussing educational challenges. However, Romania registers the lowest rate in the EU of individuals with basic or above basic overall digital skills (27.73%) - being followed by BG (35.52%) and PL (44.3%) - well below the EU average (55.56%). Moreover, the relationship between individuals with basic or above basic overall digital skills and the NEETs rate is closely linked, as countries recording low values of the percentage of individuals with basic or above basic digital skills also register a high level of NEETs rate, a relationship strongly observed in RO, BG, EL, IT.

According to *Figure 10*, Romania is the Member State with the most households without having neither a bath, nor a shower, nor indoor flushing toilet. As can be seen, in the analysed period 2010-2020 this indicator was on a decreasing trend, but nevertheless Romania stay in the first place in the EU (21.2% in 2020 over EU average - 1.5%). This situation is worrying, and government authorities must adopt measures to support local communities in developing infrastructure within households in disadvantaged environments. Another countries from EU with high values of this indicator in 2020 were BG (7%), LV (7%) and LT (6.4%).

Figure 10. *The evolution of population having neither a bath, nor a shower, nor indoor flushing toilet in their household (%)*

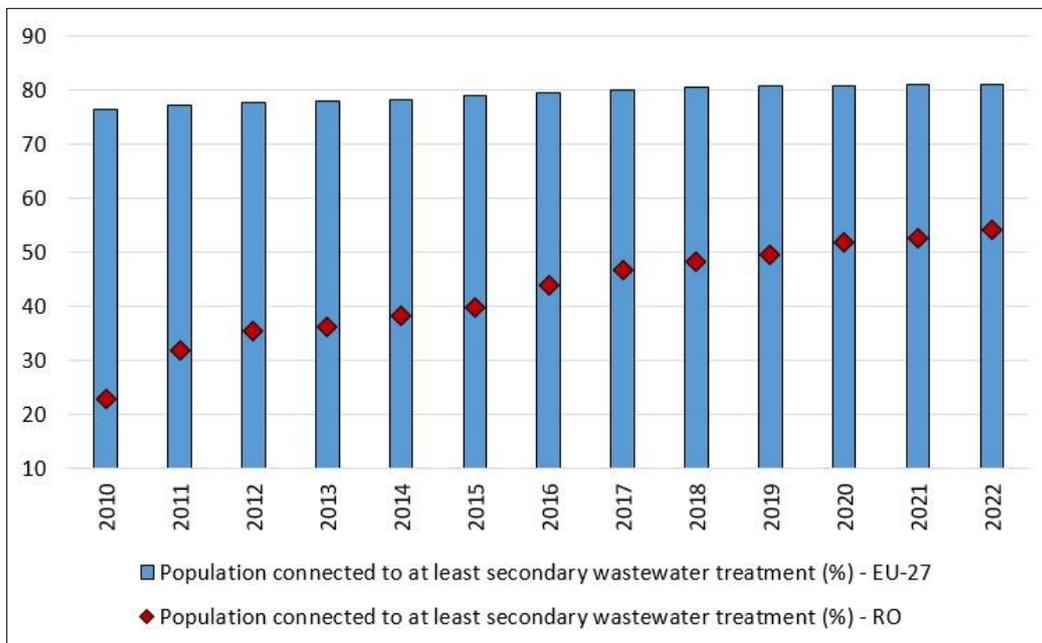


Source: *Own processings in Microsoft Office Excel based on Eurostat data*

Next, we analysed the evolution of the population connected to at least secondary wastewater treatment systems in the period 2010-2022. According to *Figure 11*, population connected to at least secondary wastewater treatment increase in Romania in the analysed

period, the highest value being recorded in 2022 - 54% (EU average 81%). Despite the progress made, Romania ranks second (with Malta in first place at 7.3), remaining well behind other countries where values exceed 99%, such as the Netherlands (99.65%) and Austria (99.15%). The low rate of population connected to at least secondary treatment systems has multiple causes: deficiency of infrastructure, disproportionate prioritization of sewage and drinking water, fragmented implementation and uneven regional distribution between urban and rural areas (almost half of the Romanian population lives in rural areas). Romania also needs to accelerate infrastructure projects regarding water treatment systems to reach EU standards and protect the environment and public health.

Figure 11. The evolution of the population connected to at least secondary wastewater treatment systems (%)

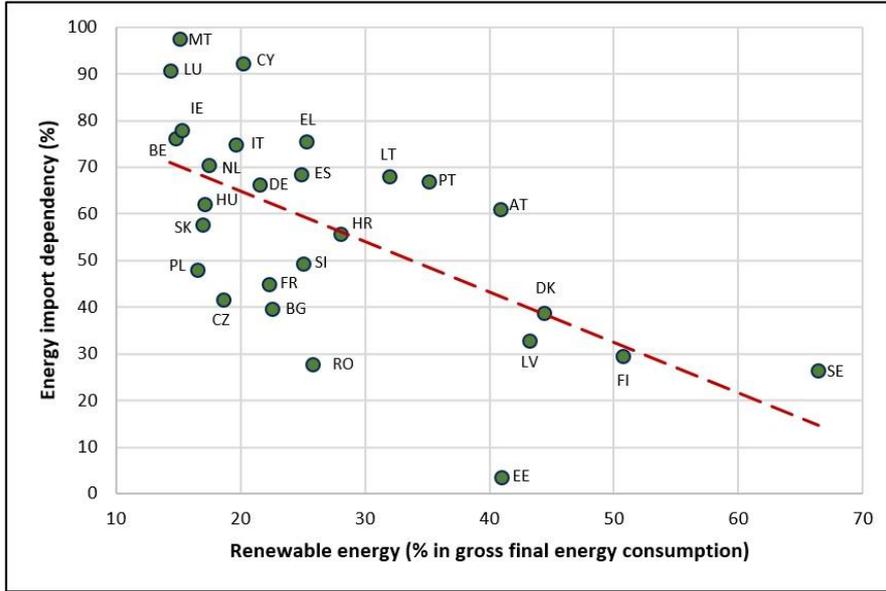


Source: Own processings in Microsoft Office Excel based on Eurostat data

Regarding the goal of affordable and clean energy (*Figure 12*), we found a negative relationship between the 2023 EU Member States' rankings in renewable energy and their performance in terms of energy import dependency, this being supported also by the high negative correlation coefficient (-62.37%).

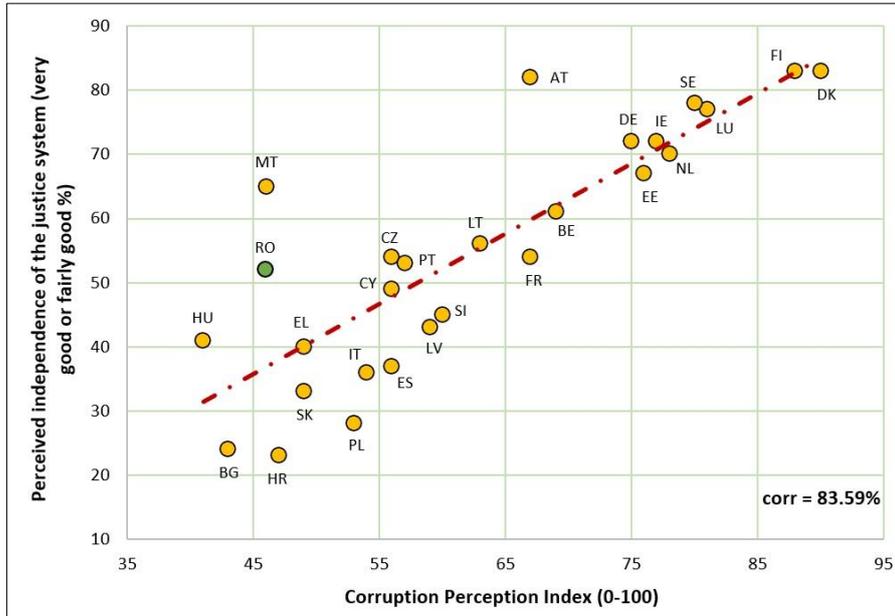
This finding highlights the importance of promoting renewable energy production, given its potential to reduce dependence on the external energy sources. According to the data, in 2023, Romania registered the third lowest energy import dependency (27.83%, compared to EU-27 dependency which is more than twice higher - 58.27%) - a lower dependency rate being found in SE (26.38%) and EE (3.47%), while in terms of renewable energy it recorded the tenth highest rate (26.78%), a higher share than the one of EU-27 (24.55%).

Figure 12. The relationship between the share of renewable energy in gross final energy consumption and energy import dependency (2023)



Source: Own processings in Microsoft Office Excel based on Eurostat data

Figure 13. The relationship between the corruption perception index and the perceived independence of the justice system (2024)



Source: Own processings in Microsoft Office Excel based on Eurostat data

The last objective examined relates to peace, justice and strong institutions (*Figure 13*). In this context, we examined the relationship between the 2024 EU Member States' rankings from the perspective of corruption perception index and their positions regarding the perceived independence of the justice system and we found a strong association (high Pearson correlation coefficient of 83.59%). This evidences the high importance of corruption perception in shaping human action, as it influences the perception on the justice system independence, but also the way people acting. Finally, the institutional pillar may provide appropriate instrumental variables for many socio-economic indicators taking into account their high association with GDP/capita and well-being indicators.

5. Conclusions

This paper shows that socio-economic challenges are more pressing than environmental ones in Romania, compared to other developed EU MS where the environmental challenges need an increased focus within the policy specific processes.

The data highlights that Romania made some progress in addressing the social challenges, but further efforts are needed taking into account social risks (also reflected in the high percentage of people being exposed to poverty or social exclusion) remain pronounced. Challenges related to education (including the ones related to high NEETs and earlyleavers rates, but also the low percentage of individuals with basic or above basic digital skills) and health systems also exerts a higher pressure on these. In addition, the rural areas in Romania remain poor, which triggers additional social risks, taking into account the high share of population not having a bath, a shower and an indoor flushing toilet in their household, but also the low rate of population connected to at least secondary wastewater treatment systems.

Even if Romania is mid-ranked regarding the renewable energy share and registers the third lowest rate of energy import dependency, our analysis confirms a strong negative relationship between EU MS positions from the perspective of these indicators (-62.37%), this confirming the important role of renewable energy in reducing the energy dependency at EU level. Nevertheless, greater efforts should be made to promote recycling behaviour and to encourage the adoption of circular economy practices through product reuse and resource efficiency. Even if the greenhouse gas emissions are low in Romania, compared to other EU MS, the policymakers should take into account when designing new policies, the mid-to-high correlation (49.02%) between the average CO₂ emissions per km from new passenger cars and domestic net greenhouse gas emissions over the period 2010-2023.

Moreover, the analysis highlights significant institutional challenges for Romania, which recommends further efforts to improve the quality of institutions taking into account their positive association with socio-economic dimension. Finally, even though Romania has reduced some economic gaps through the increase in GDP per capita, further progress can be supported by strengthening innovation capacity, including through increased - but higher quality - expenditure on research and development.

Note

⁽¹⁾ Modest increase of +0.2 years.

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