Green Economy and Sustainability

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Abstract: This paper explores the evolving concept of the green economy and its implications for sustainability-driven economic models. The objective is to examine how environmental priorities are integrated into modern economic strategies, while also identifying the tools and policies required for a successful transition. The research is motivated by increasing global attention to climate change, resource depletion, and social inequalities, all of which demand a fundamental rethinking of traditional economic growth models. The methodology includes a qualitative review of official reports, policy documents, and peer-reviewed studies, along with comparative case study analysis. Specific focus is placed on Romania and its progress in adopting sustainable business practices and green technologies. The study also analyses international initiatives such as the European Green Deal and the UN Sustainable Development Goals, to provide a broader context for the findings. Preliminary results suggest that countries investing in renewable energy, sustainable infrastructure, and circular economy models are experiencing not only environmental benefits, but also economic growth and job creation in new sectors. However, several challenges persist, including financial barriers, regulatory fragmentation, and limited awareness among key stakeholders. The findings reinforce the importance of coordinated governance, long-term planning, and public-private collaboration. This paper is significant because it connects sustainability objectives with real-world economic practices and policy decisions. It offers insights into the mechanisms through which a green economy can be achieved, while emphasizing the need for systemic change across institutions, industries, and societies. The study contributes to the academic and policy discourse by outlining practical, evidence-based recommendations for accelerating sustainable development.

Key words: Green Economy, Sustainable Development, Environmental Policy, Renewable Energy, Circular Economy

JEL classification: Q01, Q20, Q28, O44, L26

1. Introduction

The choice of topic Green Economy and Sustainability is driven by the growing urgency of addressing climate change, environmental degradation and unsustainable economic practices. As nations and organizations face increasing pressure to adopt greener policies and business models, understanding the mechanisms behind sustainable development becomes critically important. The green economy offers a framework that balances economic growth with environmental protection and social inclusion.

This paper presents a structured exploration of green economic principles, sustainable business models and technological innovation supporting environmental goals. It includes international and national case studies, with a special focus on Romania's efforts and progress. Through this research, the paper explains how the green economy is connected to sustainability and how moving toward a greener economy can help both people and the environment, especially in the European Union (EU). It aims to offer insights into how sustainability can be integrated into economic systems to support long-term prosperity and ecological stability.

2. Literature review

In recent years, terms like green economy and sustainability have become more common, especially as the world faces serious problems like climate change, pollution, and the overuse of natural resources. It emerged as a response to the limitations of traditional economic growth models, particularly those that ignore environmental costs and social disparities. According to Pearce, Markandya, and Barbier (1989), a green economy is one that improves human well-being and social equity while significantly reducing environmental risks and ecological scarcities.

The idea of a green economy became popular after the global financial crisis in 2008. It was seen as a new way to help economies recover without hurting the environment. According to the United Nations Environment Programme (UNEP), a green economy is one that helps people live better lives and reduces inequality, while also taking care of nature and using fewer resources. Sustainability, on the other hand, is a broader concept. It was clearly defined in the 1987 Brundtland Report, which said that sustainable development means meeting today's needs without making it harder for future generations to meet theirs. Sustainability includes three main parts: economic growth, environmental protection and social fairness.

Many researchers agree that the green economy is one of the best ways to achieve sustainability. It offers new solutions, like clean energy and better waste management that help protect the environment, support communities and keep economies strong.

The United Nations Environment Programme (UNEP, 2011) defines a green economy as "low carbon, resource efficient, and socially inclusive." This definition has become a benchmark in subsequent academic and policy literature. Scholars such as Jacobs (2012) and Gough (2015) have argued that green economic transitions require structural changes in production, consumption and institutional frameworks to achieve sustainability objectives.

Sustainability itself has been widely discussed since the Brundtland Report (WCED, 1987), which described sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Over time, the academic discourse has evolved to address operational models for

implementing sustainability in practice, such as the circular economy (Geissdoerfer et al., 2017) and green entrepreneurship (Cohen & Winn, 2007).

There are several ways in which moving to green economy supports sustainability. First, it helps break the link between economic growth and environmental damage. Normally, when economies grow, they use more energy and create more pollution. But green economy strategies aim to reduce emissions and waste by using renewable energy, increasing energy efficiency and reusing materials through the circular economy. Second, the green economy supports social goals. It creates green jobs in areas like solar energy, public transportation and organic farming. These jobs often help local communities and can reduce social inequalities by offering more people access to decent work and cleaner living conditions. Third, the green economy also helps make countries more prepared for the future. By using resources wisely and moving away from fossil fuels, countries can become more independent and better able to handle global crises like climate change or rising energy prices.

Recent studies focus on the role of innovation and digital transformation in enabling green economic growth. For instance, the European Commission (2020) highlights the Green Deal as a central strategy for achieving climate neutrality by 2050, emphasizing the importance of green technologies, energy efficiency and inclusive development.

The European Union is one of the world leaders when it comes to green economy policies. The EU has developed a comprehensive policy framework to guide and support the transition toward a green economy, aiming to achieve long-term sustainability and climate neutrality. At the heart of this framework is the European Green Deal, launched in 2019, which outlines a strategy to transform the EU into a modern, resource-efficient, and competitive economy with net-zero greenhouse gas emissions by 2050 (European Commission, 2019). This means Europe wants to stop adding more greenhouse gases to the atmosphere than it can remove. The Green Deal includes many areas, such as protecting biodiversity, improving public transportation, making buildings more energy efficient and promoting clean industries. It also includes the idea of a just transition, which means helping workers and communities that might be negatively affected by the move away from polluting industries. To financially support this transformation, the EU introduced the Just Transition Mechanism, including the Just Transition Fund, to help regions and workers affected by the phase-out of fossil fuels (European Commission, 2020). Moreover, the EU Taxonomy Regulation offers a standardized classification for sustainable investments, helping direct financial flows toward green activities (European Commission, 2021). Scholars highlight the importance of such mechanisms in aligning economic recovery with ecological goals, particularly in the context of post-pandemic investment (Steffen et al., 2020). The Fit for 55 package, launched in 2021, includes legislative updates to ensure a 55% reduction in emissions by 2030, reinforcing the EU's leadership in global climate governance (Scotford & Minas, 2021). The Next Generation EU plan, which allocates 30% of its €750 billion recovery budget to climate action, reflects the EU's commitment to embedding green priorities into its economic recovery strategy (European Parliament, 2021). As Fischer (2021) argues, the EU's approach represents a unique model of integrating sustainability into economic policy, providing a structured path for both environmental resilience and social equity. Together, these tools shape the EU's green economy transition and offer lessons for other regions seeking sustainable development.

The European Union's efforts to build a green economy are closely connected to its broader goal of reaching the Sustainable Development Goals (SDGs) set by the United Nations for 2030. Many of these goals focus directly on areas like clean energy (SDG 7), climate action (SDG 13) and responsible consumption and production (SDG 12). These goals are deeply tied to the principles of the green economy, which aims to reduce environmental damage while improving social well-being and economic stability. According to Barbier (2011), the green economy is not just about environmental protection, it also provides a clear path to long-term development that supports both people and the planet. For example, by investing in renewable energy and energy efficiency, countries can reduce their emissions while creating jobs and making energy more affordable.

Several scholars argue that moving toward a green economy is necessary for reaching sustainability targets. D'Amato et al. (2017) highlight that green economy strategies, such as eco-innovation, sustainable agriculture, and circular production, are essential for achieving the SDGs because they help reduce pressure on natural resources while supporting economic growth. Similarly, Jacobs (2012) points out that traditional economic model often ignore environmental costs, while the green economy offers a way to balance environmental care with human development. In this sense, the EU's policies like the Green Deal, Fit for 55 and sustainable finance tools are not just climate policies, they are also development strategies. The shift to a green economy is not only helping Europe reduces emissions and improves energy systems, but it also plays a key role in meeting global sustainability goals. Without this shift, achieving the SDGs would be much harder, both in Europe and around the world.

Romania is actively working towards a greener economy through national strategies and support from the European Union. The National Sustainable Development Strategy, updated in 2018, sets clear goals to align with the United Nations' Sustainable Development Goals and the European Green Deal. A significant focus is on transitioning to a circular economy, which emphasizes reducing waste and reusing resources. Bătușaru and Sbârcea (2023) highlight Romania's efforts to integrate circular economy principles into national policies, aiming for better resource efficiency and environmental protection. National strategies, such as the National Energy and Climate Plan (2021), demonstrate Romania's commitment to aligning with broader EU sustainability objectives. Romania's transition to a green economy is supported by both national policies and European Union funding. At the national level, Romania adopted a Sustainable Development Strategy in 2008 (updated in 2018), which sets long-term goals aligned with the United Nations' Sustainable Development Goals and the EU's Green Deal (Răpan, 2023). The government is also focusing on developing a circular

economy, cleaner energy systems and sustainable transport to meet both climate targets and economic growth objectives (Benedek et al., 2022). At the same time, EU support plays a crucial role. Romania benefits from funds like the Just Transition Fund, which helps regions such as Gorj and Hunedoara reduce dependence on coal and shift to greener activities (Marcu et al., 2022). The National Recovery and Resilience Plan (PNRR), financed through the EU's Next Generation EU program, allocates billions of euros for renewable energy, digital transformation, and green infrastructure (Constantin et al., 2022). Scholars point out that using these funds effectively is essential for Romania's successful green transition and long-term sustainability (Iojă et al., 2022).

Together, national strategies and EU-funded programs provide Romania with the tools and support needed to move toward a more sustainable, low-carbon economy.

3. Research methodology

This research adopts a qualitative methodological approach aimed at exploring the theoretical and practical dimensions of the green economy and sustainability. The study relies on secondary data collected from official reports, academic journals, government publications and international databases, including sources such as the European Commission, Eurostat and Romanian national policy documents.

The research process began with a comprehensive literature review to identify the most relevant academic contributions, conceptual frameworks, and case studies related to green economy principles and sustainable development practices. A comparative case study method was then applied to analyse both international and Romanian initiatives. Data collection included qualitative content analysis of policy documents such as the European Green Deal, Romania's National Energy and Climate Plan (2021), and sustainability reports published by Eurostat. These materials were systematically reviewed to extract common patterns, challenges, and success factors associated with the transition to a green economy. For organizing and analysing the data, Microsoft Word and Microsoft Excel were primarily used, while data visualizations (e.g., charts and tables) were generated using Python Canva and Data Wrapper for clear graphical presentation.

4. Results and discussions

4.1. International Progress

Internationally, the transition to a green economy has gained significant momentum. European countries show very different levels of progress when it comes to protecting the environment and moving toward a green economy. The 2024 Environmental Performance Index (EPI) shows that European Union countries have made different levels of progress in protecting the environment and moving toward sustainability as shown in Figure 1.

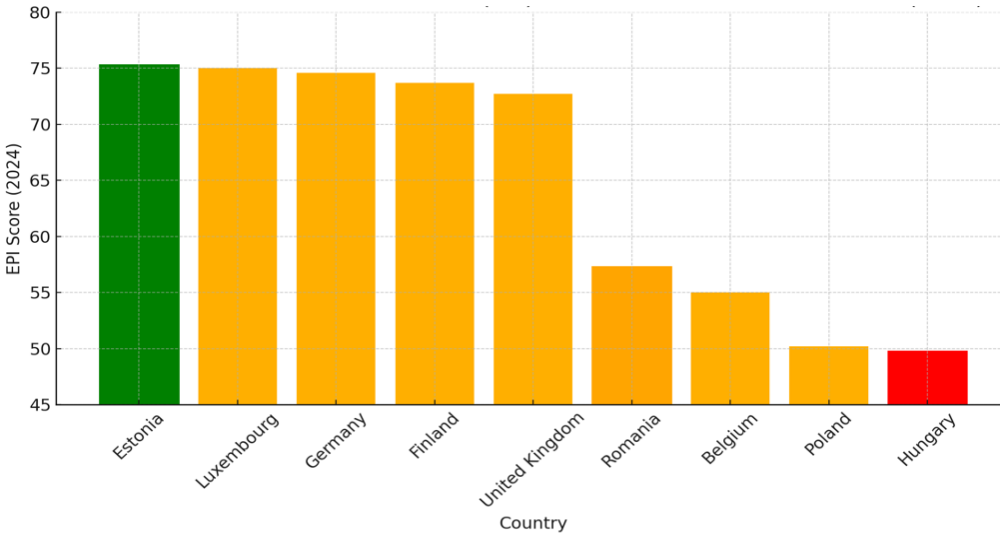

Figure 1. Environmental Performance Index (EPI) Scores – Selected EU Countries (2024)
Source: Yale Center for Environmental Law & Policy. (2024),
retrieved from https://epi.yale.edu/measure/2024/EP

Estonia is the top performer in the 2024 EPI, which is a big achievement for an Eastern European country. This is largely due to a 40% cut in greenhouse gas emissions and strong actions to protect biodiversity. Luxembourg takes second place in the index, showing that even small countries can have a big environmental impact when they adopt strong green policies and make the right investments. Germany ranks third, thanks to its well-developed environmental laws and programs that support clean energy and pollution reduction. Finland follows closely, building on its long-standing environmental values and use of renewable energy. The United Kingdom, though no longer in the EU, also ranks high and shows leadership in areas like conservation and cutting emissions.

However, not all countries are doing equally well. Belgium and Luxembourg, despite some strengths, still rely heavily on fossil fuels and have relatively low levels of renewable energy use, just 11.6% and 14.7%, respectively.

Hungary and Poland are among the weakest performers in the Climate Change Performance Index, mainly due to delays in shifting to clean energy and weak climate action policies.
Romania is somewhere in the middle, ranking 33rd globally in the EPI. While it has made some progress, especially in areas like marine conservation, it still faces challenges with renewable energy and long-term climate planning. These differences between countries show the importance of customized strategies and stronger cooperation across Europe to reach the EU's green goals together.

In the context of growing climate challenges and economic recovery needs following the COVID-19 pandemic, the European Union launched the Recovery and Resilience Facility (RRF) as a key financial instrument to support member states in building back stronger, greener, and more digitally advanced economies. One of the central goals of this facility is to promote the green transition, helping countries reduce emissions, invest in clean technologies, and move toward climate neutrality by 2050. To better understand how different EU countries are supporting the green transition through financial investment, Figure 2 shows the share of RRF funds allocated specifically to green transition projects by each member state.

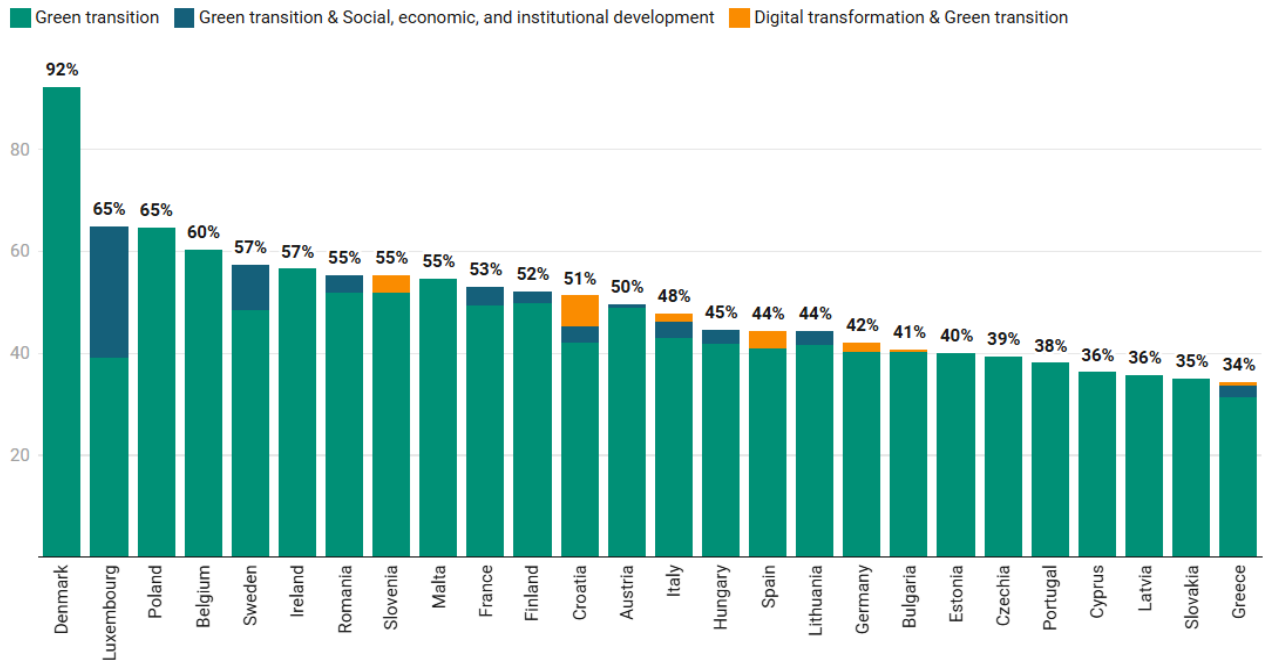

Figure 2. Share of Recovery & Resilience Facility (RRF) funds allocated to Green Transition projects in the European Union in 2023, by member state
Source: Author's elaboration based on data from Eurostat using Datawrapper

The date in the table shows how European Union member states allocated their Recovery and Resilience Facility (RRF) funds in 2023 specifically for projects supporting the green transition. These funds are part of the EU's broader response to the COVID-19 crisis and aim to help member countries recover economically while moving toward climate goals. What's interesting is that while all EU countries allocated part of their RRF funds for green transition, the amount varied a lot from one country to another. Denmark leads by a large margin, with 92% of its RRF funds dedicated to green transition projects. This reflects Denmark's strong national focus on sustainability and green innovation, such as renewable energy and low-emission transport. Countries like Luxembourg (65%), Poland (65%) and Belgium (60%) also show high levels of commitment. These countries are investing heavily in making their economies greener, whether through improving energy efficiency, reducing emissions, or supporting sustainable mobility. Romania also stands out with 55%, placing it in the top third of EU countries in terms of green funding. This is a positive sign, showing that Romania is making real efforts to align with EU climate goals, even though it has more catching up to do compared to Western and Nordic countries. On the other end of the scale, some countries like Slovakia (35%) and Greece (34%) allocated lower shares of their RRF funds to green transition projects. While these levels still meet the EU's required minimum of 37% for green investment, they suggest these countries may face more challenges when it comes to planning and financing large-scale green reforms.

It's also important to note that the chart includes combinations of priorities, such as "Green transition & Social, economic and institutional development" and "Digital transformation & Green transition." These categories show that some countries, like Poland and Finland, are trying to combine green efforts with broader reforms, such as improving governance or upgrading digital infrastructure, so that their recovery is more balanced and future proof.

The importance of these green investments can't be overstated. The EU's goal is to become climate neutral by 2050, and the Recovery and Resilience Facility plays a huge role in achieving that. By directing funds toward clean

energy, energy efficient buildings, green transportation, and environmental protection, EU countries can reduce their carbon footprints while also creating jobs, boosting innovation, and improving people's quality of life. These projects don't just help the planet, they also make the economy more resilient to future crises, like energy shortages or climate disasters. Countries that invest more in green recovery are not only helping the environment but also building a stronger and more sustainable future. For countries investing less, there is still time and support available to scale up their efforts and make sure no one is left behind in Europe's green transformation.

To better understand how European Union countries are progressing in their green transition beyond financial investments, it is also important to look at actual sustainability outcomes. While RRF fund allocation shows political and budgetary priorities, performance indicators reflect how those priorities are being put into action. For this reason, the following section analyses key sustainability indicators from 2022–2023 for all 27 EU member states. The focus is on three core areas that align with the United Nations Sustainable Development Goals (SDGs): the share of renewable energy in gross final energy consumption (SDG 7), the circular material use rate (SDG 12) and total greenhouse gas emissions (SDG 13). These indicators help measure how efficiently EU countries are transitioning to clean energy, reducing waste, and cutting emissions. By comparing countries across these three indicators, we can better assess the strengths and weaknesses of different national strategies and see where progress is being made, and where more support or reform may be needed. The results provided in Figure 3 and Figure 4 offer valuable insight into how far Europe has come in building a green economy and which areas still need attention to ensure a fair and effective transition for all member states.

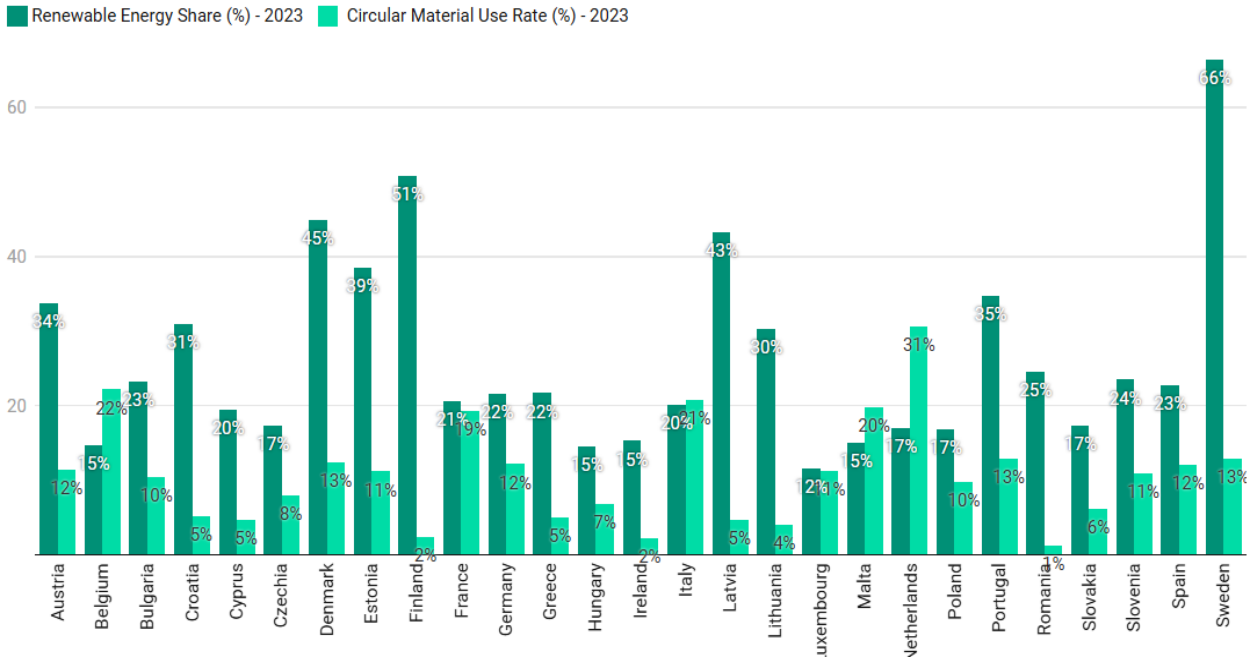

Figure 3. Comparative overview of Renewable Energy Use, Recycling and Emissions in EU Countries
Source: Author's elaboration based on data from Eurostat using Datawrapper

Regarding the share of renewable energy, Sweden leads the EU by far with an impressive 66.4% of its energy coming from renewable sources, followed closely by Finland (51%), Denmark (45%), and Latvia (43%). These countries have long invested in wind, hydro, and bioenergy, and their success shows how national policy and geography can play a big role in green energy development. In contrast, Luxembourg (12%), Belgium (15%) and Hungary (15%) have much lower shares, showing they still rely heavily on fossil fuels or nuclear power. Romania performs moderately well, with 25% of its energy from renewable sources, placing it above the EU average and showing steady progress.

The circular material use rate reflects how much material is recycled and put back into the economy. This is important for reducing waste and saving resources. The Netherlands tops this list with a 31% rate, showing strong progress toward a circular economy. Other high performers include Belgium (22%), Italy (21%), and France (19%). On the other hand, countries like Romania (1%), Ireland (2%) and Finland (2%) have some of the lowest recycling and reuse rates in the EU. These figures show that while some countries have built systems that support recycling and material recovery, others still face serious gaps in waste management and circular economy infrastructure.

Figure 4 presents the total greenhouse gas emissions, providing a picture of each country's environmental footprint.

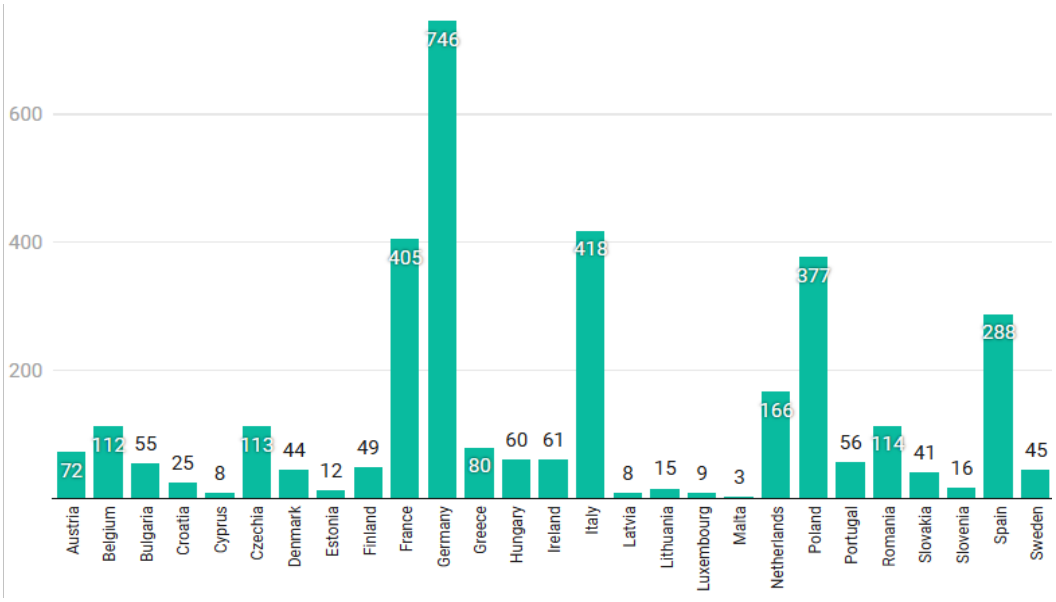

Figure 4. Comparative overview of total greenhouse gas emissions - GHG Emissions (Mt CO_2 eq) in EU Countries
Source: Author's elaboration based on data from Eurostat using Datawrapper

Germany, being the largest economy in Europe, also has the highest emissions—around 746.3 million tonnes of CO_2 equivalent. This is followed by France (405 Mt), Italy (418 Mt), and Poland (377 Mt), all of which are large, industrialized countries. On the opposite end, smaller states like Malta (3 Mt), Luxembourg (9 Mt) and Cyprus (8 Mt) have the lowest emissions, simply due to their smaller population and industrial activity. Romania emits around 114 million tonnes, which places it in the middle range of EU countries. This shows that Romania still has work to do, especially in improving energy efficiency and reducing emissions in the transport and industrial sectors.

When comparing all three indicators together, a few patterns emerge. Western and Nordic countries, like Sweden, Denmark, and Germany have adopted ambitious sustainability agendas, integrating renewable energy sources, eco-efficient infrastructure and circular economy strategies. For example, Sweden generates over 60% of its electricity from renewable sources and implements strict carbon taxation to incentivize low-emission practices. The European Green Deal (2020) has served as a catalyst for aligning national policies with EU-wide climate targets, aiming for net-zero greenhouse gas emissions by 2050. They combine high renewable energy use with lower emissions and decent circular economy practices. Meanwhile, Eastern European countries like Romania, Bulgaria, and Hungary often show average to low performance, especially in material reuse and energy transition. This highlights the need for more EU support and national reforms to help these countries catch up. While some countries are leading the way with strong green policies and technologies, others are still struggling to build the systems they need. However, all countries have strengths and weaknesses, and the data can help guide future actions and cooperation to ensure that the entire EU moves forward together toward a more sustainable and climate-friendly future.

4.2. Romania's Green Economy Efforts

Romania has made progress in renewable energy development, particularly in solar and wind power. According to Eurostat (2023), Romania achieved a 24% share of renewable energy in gross final energy consumption, close to the EU average.

However, systemic challenges persist. Romania's recycling rate remains among the lowest in the EU at 11%, and the green job sector is underdeveloped, accounting for only 2.1% of total employment. Public awareness campaigns and education on sustainability are limited, and urban infrastructure for waste sorting and energy efficiency remains inadequate in many regions.

On a positive note, the private sector is increasingly engaged. Green Group, for instance, has become a leader in plastic recycling in Eastern Europe. Additionally, start-ups like ECOTIC and Clean Recycle are innovating in waste traceability and digital circularity platforms.

Table 1 offers a side-by-side comparison of Romania and the EU in key green economy metrics.

Table 1. Green Economy Progress: Romania in the EU Context (2003)

Indicator	Romania	EU Average
Renewable Energy Share (%)	24%	28%
Recycling Rate (%)	11%	47%
Green Jobs (% of total)	2.1%	3.9%
Energy Efficiency Progress	Moderate	Advanced
Circular Economy Adoption	Low	Medium-High

Source: European Commission, Eurostat, National Energy and Climate Plan (2023)

The comparison between Romania and the EU average across several green transition indicators shows both areas of progress and significant room for improvement. Starting with renewable energy, Romania performs fairly well, with 24% of its energy coming from renewable sources compared to the EU average of 28%. While this puts Romania close to the European trend, there is still room to increase investments in wind, solar, and bioenergy to reduce dependence on fossil fuels. In contrast, the recycling rate highlights a major challenge, Romania recycles only 11% of its waste, far below the EU average of 47%. This suggests weak waste management systems and a need for better infrastructure, awareness, and policies to support recycling and reuse.

The data on green jobs also reveals a gap. Only 2.1% of Romania's total employment is in green sectors, compared to 3.9% across the EU. This means that the green economy is still underdeveloped in terms of job creation, and more efforts are needed to train workers and support businesses in sustainable industries. In terms of energy efficiency, Romania is rated as "moderate", while the EU average is "advanced." This shows that while progress is being made, Romania still needs to modernize buildings, industry, and transport systems to use less energy overall.

Romania's circular economy adoption is classified as "low," compared to the EU's "medium-high" level. This indicates limited reuse and recycling of materials, as well as a linear economic model that relies heavily on extracting new resources. Overall, the comparison shows that Romania has made some steps forward, especially in renewable energy, but lags behind in key areas like recycling, green employment, and circular economy practices. Bridging these gaps will be essential for meeting both national and EU-wide sustainability goals.

The results also underscore a significant gap between policy formulation and practical implementation. While Romania has aligned itself with EU environmental objectives through strategic documents like the National Recovery and Resilience Plan (NRRP) and the National Energy and Climate Plan (NECP), the pace of real-world execution is slow. Funding absorption, bureaucratic inertia, and fragmented governance contribute to this delay.

Another key issue is the lack of integrated data systems for monitoring green indicators, which hinders both transparency and progress evaluation. Additionally, insufficient incentives for green entrepreneurship and limited access to sustainable finance constrain business innovation in this field.

Nonetheless, Romania holds substantial potential. With its natural resources, growing technology sector and EU support, the country could become a regional leader in green innovation. Accelerating this transition requires coordinated policy actions in education, finance, and regulation. For instance, offering tax incentives for circular business models or subsidies for sustainable construction can drive broader adoption.

To illustrate the evolution of renewable energy deployment in Romania, Figure 5 presents the growth trend from 2018 to 2022.

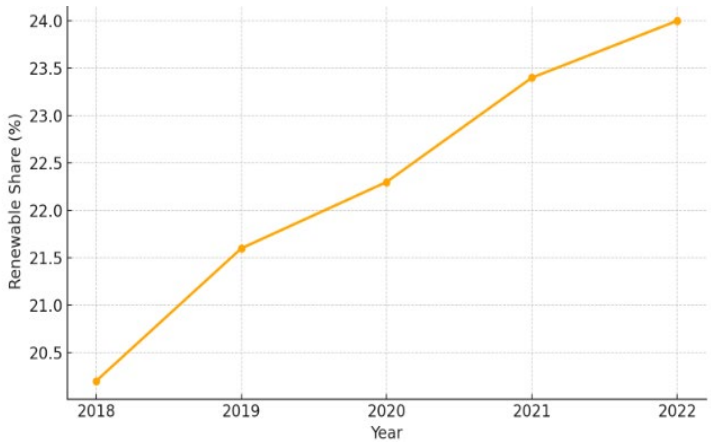

Figure 5. Renewable Energy Growth in Romania % (2018–2022)
Source: Eurostat, National Energy and Climate Plan (2023)

From Figure 4, we can see that Romania's renewable energy share started at just above 20% in 2018 and gradually increased each year, reaching 24% in 2022. The most noticeable jump occurred between 2018 and 2019, where the renewable share rose significantly. After 2019, growth continued, though at a slightly slower pace, showing consistent year-on-year progress. This upward trend reflects Romania's on-going efforts to diversify its energy sources and reduce dependence on fossil fuels, likely supported by national strategies and EU funding.

Overall, the figure illustrates positive momentum in Romania's green transition. However, despite this improvement, Romania's renewable energy share still remains slightly below the EU average (around 28% in 2022), suggesting that while progress is clear, there is still room for further development and investment in the renewable sector to align more closely with European goals.

5. Conclusions

This paper addressed the importance and implementation of the green economy and sustainability principles in both global and national contexts. The research has shown that sustainable economic development is not only a response

to environmental crises but also a viable path toward long-term economic resilience and social equity. The literature reviewed confirms that the integration of environmental objectives into economic systems is a growing global priority, supported by international frameworks such as the European Green Deal and the UN Sustainable Development Goals. Methodologically, the paper employed a qualitative approach, analysing key policy documents and case studies that reflect the current state and progress of green transitions.

The analysis demonstrated that while the European Union has made considerable progress in adopting sustainable practices, Romania is still in the early stages of implementing structural reforms. National efforts such as increased investment in renewable energy and private-sector involvement in recycling and green innovation are promising but require stronger institutional support and public engagement.

The results also revealed key gaps and challenges, including financial constraints, limited infrastructure and public awareness issues. Addressing these challenges requires coordinated action from both government and industry, supported by transparent regulation and strategic funding.

In conclusion, the transition to a green economy is not merely an environmental imperative but a socio-economic opportunity. By embracing innovation, fostering education and encouraging collaborative policymaking, countries like Romania can move toward a more sustainable and inclusive future.

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