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Can Europe Reach Its Environmental Sustainability Targets by 2030? A Critical Mid-Term Assessment of the Implementation of the 2030 Agenda

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Abstract: The Sustainable Development Goals (SDGs) serve as a pivotal framework globally, addressing environmental concerns. The 2023 Agenda emphasizes the interconnectedness of environmental issues with socio-economic development, recognizing their fundamental role in human prosperity. This research critically evaluates the mid-term progress of EU Member States in achieving the 2030 Agenda's environmental targets. Using Eurostat data for SDGs 6, 11, 12, 13, 14, and 15, we've analyzed trends via the AAA (Holt–Winters) exponential smoothing algorithm. Results highlight progress from 2015–2022 but signal concerns for 2030 targets in several Member States. These findings urge local, national, and EU stakeholders to intensify efforts toward environmental sustainability goals. Corrections are imperative, given the predicted negative trends, emphasizing the need for immediate action to rectify trajectories before it is too late.

Keywords: sustainable development; 2030 Agenda; environment sustainability; SDG 6; SDG 11; SDG 12; SDG 13; SDG 14; SDG 15



Citation: Firoiu, D.; Ionescu, G.H.; Cismaș, L.M.; Vochița, L.; Cojocaru, T.M.; Bratu, R.-Ș. Can Europe Reach Its Environmental Sustainability Targets by 2030? A Critical Mid-Term Assessment of the Implementation of the 2030 Agenda. *Sustainability* **2023**, *15*, 16650. <https://doi.org/10.3390/su152416650>

Academic Editor: Cristina Raluca Gh. Popescu

Received: 24 October 2023

Revised: 1 December 2023

Accepted: 6 December 2023

Published: 7 December 2023



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1. Introduction

Major environmental degradation, depletion of natural resources, pollution, and global warming in particular pose an increasing threat to the entire ecosystem and to all human presence in the future. Industrial exploitation and processing through the extraction of natural resources and their subsequent use for industrial, agricultural and economic development has generated and continues to generate a major disruption of biogeochemical cycles but also a major contamination of aquatic and terrestrial ecosystems with toxic heavy metals with extremely serious consequences for wildlife and human health.

In this context, it becomes very important to assess and monitor the exploitation of soil, subsoil and aquatic natural resources, heavy metal concentrations and other sources of pollution and environmental degradation so that measures can be taken to mitigate their impact on all aspects of the planet's resources, their use and terrestrial and aquatic life [1,2].

Therefore, the implementation of measures and the permanent measurement of aspects concerning environmental degradation and environmental resources by both national and international environmental organizations are today part of global and regional development programmes, such as the 2030 Agenda, which, through its 17 objectives and set of indicators, fully meets the need to reduce environmental degradation and preserve human life in the medium and long term.

On the other hand, identifying and eliminating the main sources of pollution and environmental degradation, as well as raising people's awareness through education in the

public, private and governmental sectors, can greatly contribute to reducing pollution and the effects of the development of polluting industries. Also, knowledge of the associated behavioral mechanisms can allow a better understanding of the impact of human activities on the environment and also a radical change in economic behaviors with serious effects on the future existence of the planet [3,4].

Equally important to highlight is the issue of environmental resources and their impact on economic and human activity of all kinds. With a direct influence on the quality of human activities, environmental resources influence a number of other aspects, such as those related to supporting cleaner industries, the green and alternative economy, the transition to a sustainable economy, as well as those related to safety and security, human health, quality of life, average healthy life span, etc. From these points of view (as the present work also highlights), there are significant differences between developed and less developed countries, such as the Western European countries, which have much higher positive values compared to the Eastern European countries [5–7].

The role of environmental resources in the sustainability of the planet is often quantified and monitored and there are a number of theories/methodologies that identify them, including the weight of each environmental factor in the totality of influencing factors. The criteria indicate that environmental factors are important in assessing sustainability also from a trans-country perspective, with a key role also in identifying countries/areas with low sustainability or degraded natural environments. The results also indicate that the theories are sufficiently reliable to provide management suggestions and to help stakeholders make decisions [8,9].

From another perspective, it is also important to note that human activities in large part threaten the achievement of sustainable growth and environmental protection objectives. This is because the growing human footprint and its associated anthropogenic effects often become substantially larger than those of natural physical features being comparable or even larger than the effects of climate warming in some densely developed eco-regions. For these reasons, their implications for the type of management that must be preventive, flexible and adaptable to changes in environmental factors generated, unfortunately, by human pressures and specific environmental conditions are increasingly discussed and analyzed.

Indeed, it is widely accepted that the main driver of the increasing decline in biological diversity is the increasing human pressure on the Earth's ecosystems. However, spatial patterns of change in human pressure and their relationship to conservation efforts are less well known. At present, only wilderness and protected natural areas have shown decreases in human pressure, especially the lesser known/promoted ones. Thus, the need to reduce human pressure on nature is a real challenge, both from a quantitative perspective and from the perspective of the accuracy of methods to measure actual impacts [10–12].

Another important aspect to mention is the direct and strong link between sustainable energy systems based on efficiency, low-carbon and smart technologies and environmental protection. This is because sustainable energy systems have a lower impact on the environment, to which is added their much higher performance. In this regard, a number of research works [13,14] show that the influence of energy on sustainability has increased significantly in recent years, especially in high-income countries. These studies have focused on the industrial production sub-sector, focusing mainly on technological issues and their impact on the environment.

It is thus obvious that the current period we are going through is one marked by major changes that are aimed in particular at the transition to the green economy and that directly involve the natural environment and the way its resources are used and managed. The often radical changes in environmental resources, the complexity of the factors influencing sustainability and the protection of the environment require the development of a comprehensive vision of how the economy can operate in the future so that the impact on life on the planet is minor.

Based on these general considerations, through our research we aim to provide a critical mid-term assessment of the implementation of the 2030 Agenda in EU countries,

in terms of the potential to achieve environmental sustainability targets at country level, by selecting the most relevant indicators at European level and estimating their evolution until 2030.

This research captures how the sustainable development of the economy and society (as foreseen in particular by Agenda 2030) can influence the protection of the environment, both from a quantitative and qualitative perspective at the level of the European Union Member States. By identifying the existing gaps at the level of certain European countries, from the perspective of the sustainability of environmental factors, we believe that the paper brings an added knowledge that can be extremely useful for managerial actions regardless of the decision-making level considered. Highlighting the positive expertise of some EU Member States in terms of environmental protection and sustainability adds to the knowledge in an area of research that is absolutely necessary in a period marked by turbulence and irrecoverable losses of the planet's resources.

This paper is divided into five sub-sections. Following the introduction, Section 2 presents the current literature, the research methodology is described in Section 3, Section 4 discusses the empirical results, and the last section summarizes the conclusions of the research.

2. Literature Review

2.1. *The State of the Natural Environment in the Current Global Context*

One of the most important global problems is the lack of environmental sustainability, which is mainly due to the negative consequences of human actions. Therefore, when we consider social and economic sustainability, we often refer to an exclusively healthy environment. So without a healthy natural environment, it is not possible to make efficient and sustainable use of natural resources and consequently to increase the quality of life.

From an environmental sustainability perspective, achieving the environmental Sustainable Development Goals (SDGs) set out in the 2030 Agenda is becoming a major priority for all countries of the world and for all actors directly and indirectly involved in human actions of any kind. Unfortunately, research results [15,16] show substantial differences between countries in achieving the environmental goals of the 2030 Agenda. The assessments highlight many discrepancies and inconsistencies that could lead to wrong conclusions about a country's policy decision-making, both in terms of consumption and sustainable production. This is because there are different environmental sustainability targets for each individual country and consequently specific decisions. Equally important, there is a need for relevant environmental indicators that reflect as concretely as possible the results/discrepancies in targets and achievements.

Environmental sustainability (as indeed the reality of all countries makes clear) is one of humanity's most daunting problems and continues to attract the attention of researchers and policymakers. Progress in tackling environmental issues under the 2030 Agenda, but also in implementing the environmental SDGs at country and company level, remains a challenge, especially in developing countries, which compels policymakers to take immediate and future actions relevant to the achievement of the 2030 Agenda.

Nevertheless we highlight a positive change in particular in the appetite for sustainable practices at both country and company level, even if the practicality and practical approach to solutions for achieving the goals set by the 2030 Agenda is often quite far away. Finding a balance between mitigating environmental degradation and achieving sustainable economic growth is therefore a defining strategic goal that can only be achieved through consistent and meaningful action.

2.2. *Prerequisites for Environmental Sustainability toward Meeting the 2030 Agenda Targets*

Recent studies highlighting environmental sustainability [2,17] reveal a positive and significant long-term link between environmental sustainability, renewable energy consumption and economic growth. The results indicate that gross real fixed capital accumulation, carbon emissions and other environmental factors are the main determinants of long-term growth. There are also bidirectional long-run causal relationships between

renewable energy consumption, economic growth and other determinants of growth. Harnessing renewable energy sources is a reliable way of mitigating environmental pollution and consequently achieving the Sustainable Development Goals (SDGs) by 2030 through renewable energy consumption and carbon emission reductions.

From the perspective of companies and the activities they undertake, promoting corporate socially responsible performance can make a definite contribution to achieving the environmental goals of the 2030 Agenda. Specialist findings [18–20] highlight that companies that show a clear sustainability and community orientation and adopt more initiatives, mostly focused on environmental and social issues, have a positive reputation and image, thus contributing to improving the quality of actions to achieve the SDGs. Therefore, meeting the requirements of sustainable development is a major priority for companies that need to adjust their operations and strategies to the requirements of the SDGs. In this respect, we identify the Global Reporting Initiative as a framework for promoting sustainability reporting on the achievement of each environmental SDG.

Growing trends in concrete initiatives and actions to achieve sustainable environmental objectives can be identified in many companies. However, there are areas where the implementation of the SDGs is becoming an absolute priority, given the negative environmental impacts of specific business activities. In this respect, we identify one of the most obvious problems creating irreparable damage to the planet's resilience, namely the increase in human mobility and consequently in the demand for passenger transport with a negative impact on the sustainability of the natural environment.

Even if the increase in mobility in an area is linked to the increase in GDP at the same time, it produces one of the most negative impacts on the environment, mainly due to the increase in private car mobility and carbon emissions. Thus, the issue of increasing mobility without increasing environmental impacts is a real challenge addressed globally from multiple points of view, in particular from the perspective of public transport, clean technologies, and the introduction of ITC in all human activities, thus contributing to reduce the pressure on the means of transport and consequently on the environment. In other words, new decision-making models for the provision of transport services are a sustainable way to steer people's mobility towards environmental goals [21,22].

Not to be overlooked in this context is the role of local communities at the heart of global sustainability efforts. This is because what happens locally can affect regional and national environmental and social systems and cumulatively have a global environmental impact. This is why the 2030 Agenda calls for local action to achieve the Sustainable Development Goals (SDGs) as a matter of priority, which can constrain local governance, particularly in terms of the trade-offs between targets, the complexity and uncertainty embedded in social and environmental systems, and the need to align efforts across multiple levels of governance. Therefore, the need arises to make the SDGs part of the local governance process, with the potential to transform the goals into permanent practices and activities [23–25].

The transition towards sustainable development of communities in relation to the environment, especially urban ones, often generates a major pressure on the bodies directly and indirectly responsible for the implementation of the 2030 Agenda. However, adopting a perspective of permanent assessment of the state of the environment and the gaps it manifests at certain points in time can generate a responsible approach to local consumption, the moments of intensity of consumption by citizens, the "consumption footprint". The "consumption footprint" assesses the impact of five areas of consumption (food, mobility, housing, household, goods) to which is added the "environmental footprint" as the impact on ozone depletion (housing, food and mobility being the main factors). The "consumption footprint" thus allows the identification of local consumption trends, thus connecting them to a global dimension of impact [26].

From another perspective, improving energy efficiency and mitigating environmental problems through environmental regulations and taxes are fundamental elements of sustainable development policies. From this perspective, three types of causality are identified:

(1) environmental taxes, energy consumption and energy efficiency; (2) environmental taxes and environmental quality; (3) energy consumption (renewables, non-renewables and fossil fuels) and environmental damage. However, the role of environmental taxes is still ambiguous [27,28].

Undeniably, energy is indispensable to achieve economic development, which unfortunately generates CO₂ emissions and contributes dominantly to environmental degradation and climate change. Therefore, only green energy can contribute to achieving both sustainable development and environmental sustainability as we identify emission-free energy sources. Long-term analyses have shown that green energy consumption contributes to long-term emission reductions. However, economic growth increases CO₂ emissions, while urbanization is detrimental to environmental quality. Therefore, shifting policymakers' attention from conventional economic growth to green growth is a key determinant of green growth, in addition to ensuring political stability and reliable macroeconomic policies that can easily control or address unpredictable future economic problems [29,30].

2.3. Programmes and Actions on the State of the Environment

In terms of highlighting the importance of the environment in the sustainable development of the planet, we identify some remarkable concerns of specialists who, through their actions and proposed measures, support a different approach to the way society responds to the requirements related to environmental resources and quality of life.

In this context, we highlight the UNEP (United Nations Environment Programme) report, produced since 1995, which monitors environmental change, often raising warning signals about how human actions are negatively affecting the planet's environmental resources. In this context, we identify the Global Environmental Outlook (GEO), which includes a series of reports that analyze the state and direction of the global environment [31]. It is a global process led by UNEP at regional, national and local levels around the world. The process provides an assessment of the state of the environment, an evaluation of the effectiveness of policies and actions taken to address environmental problems as well as projections of future environmental trends.

From this perspective, under the theme "Healthy Planet, Healthy People", we identify six reports completed so far, the last report being GEO-6, published in 2019; GEO-7, for which the first meeting was in March 2023, is in progress.

Like all previous reports (five in number), GEO-6 presents the current state of the environment, but unfortunately, this report showed that decision makers at all levels need urgent and inclusive action to achieve a healthy planet with healthy people.

The fact that the health of the planet is deteriorating from one year to the next is all the more problematic because ecosystem health has a major direct and indirect impact on human health and well-being, through the impact of polluted air on human health, the impact of land degradation on food security, etc., and consequently on human well-being [32].

Importantly, GEO-6, through the reports included, has responded to key issues of long-term planetary sustainability, such as: the state of the global environment; how people and their livelihoods are affected by environmental change in terms of health, food security and general well-being; the environmental liabilities and risks in different regions; the contribution of sustainable policy measures to environmental protection and how effective have they been; and the opportunities to transform the global human environment into a sustainable system [31].

The need to identify the current state of the planet in terms of resources and their long-term sustainability seems to be not only the key element in people's exit but the central pawn to which all human activity of any kind must refer.

At the same time, the 2030 Agenda, with its measures and objectives, with its indicators for reporting on all actions taken by society, is in this context the only complex, concrete strategy that, once implemented in all countries of the world, can ensure long-term existence, even if the reference year is 2030.

The elements that GEO-6 also focuses on are tightly focused on a series of global targets identified in the 2030 Agenda, which specifically refer to: biodiversity, land, air, water and oceans, all key elements of the planet's and society's future.

How each human action contributes to the implementation of the sustainable measures outlined by 2030, how each country responds to these real and major challenges, how economic agents contribute through their activities to environmental sustainability, are just some of the questions that the specialists directly or indirectly involved try to answer.

2.4. Agenda 2030 and Environmental Goals

Environmental sustainability can be ensured through the implementation of measures and actions (SDGs) that address the specific elements of biodiversity, land, air, water and oceans.

Responding to these challenges but also identifying how the countries of the world (in the case of the present work, the EU Member States) will achieve the environmental targets set for 2030 through the measures implemented requires the analysis of a series of SDGs that highlight, through content and specific indicators, the state of sustainability of environmental elements and that are found especially in SDG 6 (Clean water and sanitation), SDG 11 (Sustainable cities and communities), SDG 12 (Sustainable consumption and production), SDG 13 (Climate action), SDG 14 (Life below water), SDG 15 (Life on land).

Although there are a number of specific indicators that measure how environmental sustainability is ensured, there are still a number of gaps, resulting from the difficulty with which certain elements can be quantified, such as those related to the effects of environmental change, air and water, pollution and other environmental conditions [31].

However, through the SDG-specific indicators above, we can highlight the major changes or shifts that specific aspects of the environment have undergone over time, changes that can be useful to correct unfavorable aspects or prevent the occurrence of less desirable phenomena.

2.4.1. SDG 6 (Clean Water and Sanitation)

The international community has been subjected to real 21st century sustainable development challenges. However, there is unfortunately a certain limitation generated by the fact that figures can often be inaccurate and cannot substantiate innovative proposals to improve the management of water resources in general and water supply, sanitation and wastewater management in particular, with negative health and environmental impacts for billions of people globally [33,34].

It is therefore absolutely necessary to pay much more attention to how the natural environment is impacted, especially as it is directly affected by human behavior, policies, socio-cultural norms, etc. At the same time, although we are witnessing an increase in negative impacts on the natural environment, unfortunately in many situations the financing and technical capacities of the world's countries are not extremely flexible and dynamic, and often insufficient to ensure that sustainable development efforts are as expected and that environmental protection is highly visible [35].

2.4.2. SDG 11 (Sustainable Cities and Communities)

Based on estimates that some 6.7 billion people will live in cities by 2050, city planning decisions in the 21st century will play a crucial role when talking about sustainable development and protecting the planet's resources [36].

Therefore, achieving the SDG targets for 2030 and beyond must be seen from the perspective of the structure of cities and communities, because their sustainability directly affects the existence of the planet. Consequently, benchmarking, monitoring and evaluating urban planning policies and interventions are absolutely essential for optimizing sustainability outcomes for urban communities. However, although there are national and regional indicators as well as a framework for action for cities established by the UN,

many SDG Indicator measures unfortunately only assess outcomes and not the policies and interventions needed to achieve results on the ground [36,37].

A more comprehensive approach to the issue of sustainability of the natural environment through benchmarking, monitoring and evaluation of policies designed to achieve healthy and sustainable cities and to assess spatial inequalities is therefore absolutely necessary.

This is evident in some initiatives taken to create low- to zero-carbon cities, to build sustainable structures. From this point of view, we identify new cities with well-impregnated sustainability practices (cities in South Korea, the Middle East, Asia) that can be model cities for regenerating polluted, congested and environmentally unfriendly cities in many parts of the world. Ironically, cities occupy about 2% of the earth's land area, yet consume 60–80% of global energy. Also, the global urban population has grown from 220 million to about 2.8 billion in the 20th century and is projected to grow to 6.9 billion by 2050, representing about 70% of the world's population [38,39].

In this context, it is absolutely vital for the sustainability of the natural environment that urban agglomerations are strictly organized and directed towards energy conservation and energy efficiency, water security, efficient use of land resources, implementation of sustainable building standards, social and economic equity, or food waste management.

2.4.3. SDG 12 (Sustainable Consumption and Production)

It is clear that the global human community is facing an increasingly urgent dilemma linked primarily to improving living standards while at the same time reducing environmental impacts and recognizing the need to improve sustainable consumption and the fact that sustainability needs to be addressed at all stages, from production and marketing to consumption and waste. On the other hand, and not to be overlooked, there is a growing emphasis on individual sustainable consumption, which involves human behavior and educating human behavior [40,41].

At the same time, sustainable consumption implies the concept of a circular economy, which responds to resource scarcity and climate change by reducing the volume of natural resources used and increasing the recycling of products and materials in the economic system.

In order to achieve sustainable consumption, it is clear that production and consumption practices need to change. This is because it is business models that influence processes; they define how a company does business and influence the company–consumer–natural environment relationship. On the other hand, the most promising business models for sustainable consumption are those that reduce overall consumption levels but also involve consumer effort [42,43].

2.4.4. SDG 13 (Climate Action)

In terms of SDG 13, the international community has committed itself to combating climate change and thereby achieving the Sustainable Development Goals (SDGs). It is thus recognized that the governance of climate change and sustainable development need to be more strongly interlinked in order to maximize effectiveness and strongly reduce negative impacts on the natural environment.

At this juncture, increased attention to technology development and transfer is needed to boost the potential to achieve a more sustainable level of the environment with all its components: biodiversity, water, oceans, land.

However, organizations should position themselves much more effectively to bridge in particular the gap between the generation of scientific knowledge and its implementation in climate policies and programmes (“the knowledge–action gap”), thereby enabling different areas to align with stakeholders [44–46].

This is because global warming has been a major issue in recent decades, causing major climate change due to carbon dioxide emissions, greenhouse gases that have a direct impact on forest production, crop production, livestock production, energy consumption, population growth, temperature and precipitation.

Reducing carbon emissions is therefore a key strategy for mitigating climate change and promoting sustainable development. Policymakers should therefore deepen environmental regulatory reform by adapting it to local conditions through promoting policy innovation and the optimization of the carbon reduction scheme [47,48].

2.4.5. SDG 14 (Life Below Water)

Oceans are of particular importance in sustaining the sustainability of the planet. However, we still face a significant challenge in understanding how the oceans influence human life and existence in the long term.

In September (2023), the Sustainable Development Goals (SDGs) Summit—convened by the United Nations (UN) General Assembly—took place. Heads of state and government met in New York, USA to discuss measures to accelerate progress towards the 17 SDGs. In this context, SDG 14 (“Life Under Water”) was highlighted as important in view of the fact that climate change, pollution, overfishing and ocean acidification continue to threaten marine biodiversity and consequently the sustainability and health of ocean ecosystems. So identifying solutions to move towards more sustainable oceans is an urgency to which all responsible bodies must respond with well-informed, implemented and constantly monitored measures and policies [49,50].

However, the situation is quite complicated, because ocean data have many gaps, with most ocean data being collected by direct measurement or modelling, making it quite difficult to get a clear reflection of the situation for a vast environment covering more than 70% of the earth’s surface. Similarly, marine litter data are collected by different countries with different protocols and are not consolidated globally. There are also significant gaps in terms of the environmental impacts of marine litter, including how plastic ingested by fish affects human consumption [31].

2.4.6. SDG 15 (Life on Land)

Sustaining life on land is also a priority established by global agreements, a priority generated in particular by the loss of forests and the accelerated decline of biodiversity. From this point of view (SDG 15), there are both priorities and challenges, trade-offs that this target has to take into account compared to other SDGs and which mainly result from the competition for land. We can thus highlight the trade-offs that the world’s countries need to make to increase food production to achieve “zero hunger” (SDG 2) while preserving “life on land” (SDG 15). Therefore, reaching different trade-offs in a context where space is becoming increasingly limited is a real challenge that needs to be linked to the need to increase agricultural production generated in turn by global population growth. Therefore, the rational allocation of agricultural land could reduce trade-offs between the SDGs for food production and land biodiversity conservation [51,52].

Factors such as changes in the food system (food demand, agricultural technology), political stability and investment security, biodiversity conservation, avoiding long carbon sinks from deforestation, energy crop yields, can be priorities in designing sustainable crop production policies and can resolve difficult trade-offs such as food vs. energy supply, renewable energy vs. biodiversity conservation or increasing yields vs. reducing environmental problems of intensive agriculture [52].

Consequently, although there are many uncertainties when dealing with the natural environment, current solutions to such problems can be found in global initiatives which, although sometimes only referring to certain parts of the world, can be extended to less developed regions and those less willing to make substantial financial allocations to prevent, mitigate, or eliminate problems affecting the natural environment.

In the light of these general considerations, and given the paucity of such comprehensive studies published to date, our research attempts to provide a critical mid-term assessment of the implementation of the 2030 Agenda in EU countries in terms of environmental sustainability targets. This assessment focuses on the potential to achieve

environmental sustainability targets at the national level by selecting relevant indicators at the European level and forecasting their evolution until 2030.

This research captures how the sustainable development of the economy and society (as foreseen in particular by Agenda 2030) can influence the protection of the environment, both from a quantitative and qualitative perspective at the level of the EU Member States. By highlighting existing gaps in environmental sustainability in selected European countries, the paper contributes valuable information applicable to management actions at all levels of decision making. In addition, the identification of positive practices in some EU Member States with regard to environmental protection and sustainability improves knowledge in a critical area of research, which is particularly crucial at a time of turbulent global resources and irrecoverable losses.

3. Research Methodology

To assess the present status of environmental sustainability objectives within EU member states, at the mid-point of the implementation of the 2030 Agenda's environmental targets, our research relies on data disseminated by the official statistical service of the European Commission, namely Eurostat. Thus, the key values of the specific indicators SDG 6, SDG 11, SDG 12, SDG 13, SDG 14 and SDG 15 have been aggregated for a longer period of time, starting with the year 2000, or the first year reported for each indicator, and up to the latest published data [53–58]. In doing so, we have aimed to include in our analysis a longer period of time before the year of the adoption of the Paris Agreement, precisely in order to capture in the evolution of the trend also this event with major implications on the evolution of the selected indicators.

The analytical framework proposed for the examination of the collected data was constructed with the objective of scrutinizing and prognosticating the attainment of targets endorsed by the 27 member states of the European Union until the year 2030. This endeavor aimed to elucidate, over time, the prospective shortfall in meeting the stipulated benchmarks for environmental sustainability indicators. Considering the adoption of the Paris Climate Accord in 2015, our intention was to investigate the trajectory of the selected indicators during an equivalent timeframe preceding and succeeding the year 2015. The modeling of available data spanned from the year 2000 (or the earliest reported year, if more recent than 2000) to the current date. Consequently, our analysis sought to investigate potential fluctuations in the pace of progression, emphasizing conceivable increments or decrements in the evolution of the specified indicators.

The existing literature distinguishes between two categories of available models: traditional ones (e.g., ETS, ARMA, ARIMA, SARIMA) and contemporary models developed leveraging technological advancements, with the intent to supplant already existing models in time series forecasting (such as LSTM, FBProphet, DNN). An examination of the existing body of literature scrutinizing the pros and cons of employing econometric models for time series forecasting reveals the absence of a universally acknowledged superior forecasting model [59–67].

Within this context, two significant econometric time series forecasting models have emerged as pertinent to the objectives of this research: the ETS model (Error Trend and Seasonality, commonly referred to as exponential smoothing) and the ARIMA model (AutoRegressive Integrated Moving Average). Given the aim of our research, as well as the evolution of indicators over the period examined, we decided to use in our research the AAA (Holt–Winters) version of the exponential smoothing ETS algorithm model, because this type of model describes how unobserved components of the data (error, trend, and seasonality) change over time. ETS models inherently capture trends and seasonality within the exponential smoothing framework, making them more flexible in handling different types of trends and seasonality, without the constraint of time series stationarity.

ETS algorithms are known for their adaptability and simplicity. It is particularly advantageous to use this forecast model in situations where the data exhibit different levels of seasonality or when the seasonality pattern changes over time. ETS accommodates these

variations through its three components: error, trend, and seasonality. This adaptability allows it to capture and model complex patterns in the data, making it a valuable tool for forecasting time series data with changing dynamics. Another advantage of ETS models over ARIMA models is that ETS models can better adapt to changing trends and seasonality and often perform well when dealing with non-linear patterns or changing trends, being more versatile and suitable for a wide range of time series data, including those with varying trends and seasonality [64,65,68,69]. The examination of initial outcomes derived from implementing the ETS models revealed no aberrant or disproportionate values, affirming the credibility of the models and their ability to produce coherent results.

In the AAA (Holt–Winters) iteration of the exponential smoothing ETS algorithm, weights were allocated to temporal data variances proportionally to the terms of their geometric progression, as delineated by the exponential scale $\{1, (1 - \alpha), (1 - \alpha)^2, (1 - \alpha)^3, \dots, \infty\}$ [70–72]. The forecasted value constitutes a continuation of the historical values up to the specified target date, adhering to the chronological sequence, as per the fundamental equations for the Holt–Winters’ multiplicative method [73]:

$$\text{level : } L_t = \alpha \frac{Y_t}{S_{t-m}} + (1 - \alpha)(L_{t-1} + B_{t-1}) \quad (1)$$

$$\text{trend : } B_t = \beta(L_t - L_{t-1}) + (1 - \beta)B_{t-1} \quad (2)$$

$$\text{seasonal : } S_t = \gamma \frac{Y_t}{L_{t-1} + B_{t-1}} + (1 - \gamma)S_{t-m} \quad (3)$$

$$\text{forecast : } F_{t+m} = (L_t + B_t m) + S_{t-s+m} \quad (4)$$

where:

L_t = the level of the series;

B_t = the trend;

S_t = the seasonal component;

F_{t+m} = the forecast for m periods ahead;

α, β, γ = smoothing parameters;

s = length of seasonality (e.g., number of months or quarters in a year);

m = frequency of the seasonality (i.e., the number of seasons in a year).

In addition to examining the forecasted data for 2030, this study aimed to offer supplementary perspectives on the progression of chosen indicators through dynamic index analysis. This method involves evaluating pivotal intervals within the designated time-frame, notably 2025 and 2030.

The estimation of dynamic indices was conducted by employing the ratio of the indicator’s value at a specific moment in time to its value in the base year. This was achieved through the utilization of Equation (5), outlined as follows:

$$D_Index = \frac{I_n}{I_0} \times 100\% \quad (5)$$

where:

I_n = the indicator value in a given moment of time;

I_0 = the indicator value in the base period (2015).

The incorporation of the “ceteris paribus” (all other things being equal) principle is of paramount importance in the context of accurate and robust forecasting within the realm of scientific research. Integrating this principle into forecasting models allows for the systematic assessment of the individual influences of factors on predicted outcomes, thereby augmenting the comprehension of intricate systems. This approach, in turn, facilitates the discernment of causal relationships and aids in the mitigation of potential confounding effects, thereby engendering forecasts of higher reliability and precision. The adherence

to the paribus principle concurrently advances the transparency and rigor of forecasting methodologies, ultimately amplifying the reproducibility and generalizability of research findings. Consequently, its incorporation assumes a pivotal role in the progression of the forecasting domain and the promotion of evidence-based decision making across diverse domains.

Using the dynamic index analysis, individual dynamic indices were calculated for each Member State for the selected period, thus defining the trend along which the values of each indicator lie.

4. Empirical Results

Following the outlined research methodology, this section presents the findings related to each selected indicator through concise tabular formats. Each table comprises initial columns displaying indicator values for the year 2015, succeeded by subsequent columns documenting values for 2020. The third and fourth columns provide forecasted estimates for 2025 and 2030, respectively. These tabular datasets afford a comprehensive overview of the outcomes garnered for each indicator (Tables 1–16).

Table 1. SDG 6(30)—Biochemical oxygen demand in rivers (mg O₂ per liter).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	3.04	2.65	2.45	2.30	0.87	0.81	0.76	DOWN
Belgium	2.91	2.28	2.57	2.56	0.78	0.88	0.88	DOWN
Bulgaria	2.72	3.01	1.73	1.16	1.11	0.64	0.43	DOWN
Czech Republic	2.75	2.54	2.01	1.68	0.92	0.73	0.61	DOWN
Estonia	1.73	1.53	1.65	1.65	0.88	0.95	0.95	DOWN
Ireland	1.16	1.22	1.06	0.98	1.05	0.91	0.84	DOWN
Spain	4.53	3.58	4.12	4.49	0.79	0.91	0.99	DOWN
Croatia	1.92	1.59	1.21	0.92	0.83	0.63	0.48	DOWN
Italy	2.34	1.58	1.57	1.37	0.68	0.67	0.59	DOWN
Cyprus	2.00	1.20	2.42	2.36	0.60	1.21	1.18	NONE
Latvia	1.16	1.45	0.84	0.60	1.25	0.72	0.52	DOWN
Lithuania	2.05	2.13	1.87	1.68	1.04	0.91	0.82	DOWN
Austria	1.35	1.47	1.53	1.55	1.09	1.13	1.15	NONE
Poland	2.75	2.69	1.80	1.27	0.98	0.65	0.46	DOWN
Romania	3.97	3.43	3.05	2.57	0.86	0.77	0.65	DOWN
Slovenia	0.84	0.73	0.0	0.0	0.87	0.00	0.00	DOWN
Slovakia	2.75	2.07	2.28	2.11	0.75	0.83	0.77	DOWN

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 2. SDG 6(40)—Nitrate in groundwater (mg NO₃ per liter).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	23.32	20.75	21.57	20.82	0.89	0.92	0.89	DOWN
Belgium	27.90	28.65	27.86	27.26	1.03	1.00	0.98	DOWN
Bulgaria	31.26	30.51	34.14	36.83	0.98	1.09	1.18	UP
Czech Republic	18.15	18.71	17.31	16.65	1.03	0.95	0.92	DOWN
Germany	26.90	25.10	28.28	29.51	0.93	1.05	1.10	UP
Estonia	4.52	5.50	5.46	5.81	1.22	1.21	1.29	UP
Ireland	14.21	13.85	14.02	14.40	0.97	0.99	1.01	UP
France	22.66	19.18	19.13	17.15	0.85	0.84	0.76	DOWN
Cyprus	70.48	7.84	45.53	42.58	0.11	0.65	0.60	DOWN
Latvia	4.16	3.93	5.72	6.45	0.94	1.38	1.55	UP
Malta	59.85	59.43	56.48	54.92	0.99	0.94	0.92	DOWN
Austria	23.62	21.12	19.49	17.62	0.89	0.83	0.75	DOWN
Portugal	16.76	21.93	18.35	18.10	1.31	1.09	1.08	NONE
Slovenia	12.84	12.45	12.40	11.78	0.97	0.97	0.92	DOWN
Slovakia	19.50	18.62	15.88	14.84	0.95	0.81	0.76	DOWN

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 3. SDG 6(50)—Phosphate in rivers (mg PO₄ per liter).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	0.058	0.072	0.066	0.068	1.24	1.14	1.17	NONE
Belgium	0.188	0.197	0.202	0.207	1.05	1.07	1.10	UP
Bulgaria	0.094	0.188	0.075	0.038	2.00	0.80	0.40	DOWN
Czech Republic	0.126	0.078	0.121	0.126	0.62	0.96	1.00	NONE
Denmark	0.051	0.055	0.052	0.053	1.08	1.02	1.04	NONE
Estonia	0.034	0.025	0.024	0.022	0.74	0.71	0.65	DOWN
Ireland	0.036	0.043	0.038	0.037	1.19	1.06	1.03	NONE
France	0.042	0.055	0.048	0.045	1.31	1.14	1.07	NONE
Croatia	0.022	0.026	0.015	0.009	1.18	0.68	0.41	DOWN
Latvia	0.013	0.020	0.009	0.003	1.54	0.69	0.23	DOWN
Lithuania	0.080	0.250	0.226	0.294	3.13	2.83	3.68	UP
Austria	0.032	0.029	0.031	0.030	0.91	0.97	0.94	NONE
Romania	0.105	0.107	0.100	0.103	1.02	0.95	0.98	NONE
Slovenia	0.037	0.023	0.023	0.022	0.62	0.62	0.59	DOWN
Slovakia	0.092	0.057	0.097	0.076	0.62	1.05	0.83	NONE
Finland	0.018	0.018	0.016	0.017	1.00	0.89	0.94	NONE
Sweden	0.008	0.007	0.003	0.000	0.88	0.38	0.00	DOWN

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 4. SDG 6(60)—Water exploitation index, plus (WEI+) (%).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	4.39	3.82	3.49	3.16	0.87	0.79	0.72	DOWN
Belgium	4.54	4.78	3.93	3.09	1.05	0.87	0.68	DOWN
Bulgaria	1.27	1.33	1.24	1.15	1.05	0.98	0.91	DOWN
Czech Republic	10.76	9.98	10.92	11.86	0.93	1.01	1.10	NONE
Denmark	5.39	5.70	6.47	7.24	1.06	1.20	1.34	UP
Germany	4.88	4.31	3.30	2.28	0.88	0.68	0.47	DOWN
Estonia	4.03	4.03	0.89	0.01	1.00	0.22	0.00	DOWN
Ireland	0.55	0.61	0.60	0.59	1.11	1.09	1.07	NONE
Greece	10.28	12.09	11.02	9.96	1.18	1.07	0.97	DOWN
Spain	11.44	9.05	8.44	7.83	0.79	0.74	0.68	DOWN
France	2.53	1.99	1.64	1.29	0.79	0.65	0.51	DOWN
Croatia	0.19	0.17	0.17	0.17	0.89	0.89	0.89	NONE
Italy	11.00	8.60	8.19	7.78	0.78	0.74	0.71	DOWN
Cyprus	117.33	104.30	101.36	98.41	0.89	0.86	0.84	DOWN
Latvia	0.40	0.29	0.29	0.28	0.73	0.73	0.70	DOWN
Lithuania	0.78	0.49	0.34	0.18	0.63	0.44	0.23	DOWN
Luxembourg	0.60	0.60	0.65	0.70	1.00	1.08	1.17	NONE
Hungary	1.44	1.24	1.22	1.19	0.86	0.85	0.83	DOWN
Malta	28.62	33.26	35.44	37.62	1.16	1.24	1.31	UP
Netherlands	3.80	4.92	5.16	5.40	1.29	1.36	1.42	UP
Austria	1.97	1.59	1.66	1.72	0.81	0.84	0.87	NONE
Poland	8.32	7.64	7.69	7.75	0.92	0.92	0.93	NONE
Portugal	29.10	8.68	0.12	0.91	0.30	0.00	0.00	DOWN
Romania	23.83	20.76	23.55	26.35	0.87	0.99	1.11	NONE
Slovenia	0.75	0.55	0.49	0.44	0.73	0.65	0.59	DOWN
Slovakia	0.33	0.54	0.53	0.51	1.64	1.61	1.55	UP
Finland	1.07	1.04	0.87	0.70	0.97	0.81	0.65	DOWN
Sweden	0.76	0.79	0.58	0.38	1.04	0.76	0.50	DOWN

Source: Eurostat, own calculations.

Table 5. SDG 11(31)—Settlement area per capita (sqm per capita).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	680.6	724.9	775.4	825.1	1.07	1.14	1.21	UP
Belgium	581.6	586.5	598.3	611.1	1.01	1.03	1.05	UP
Czech Republic	616.1	631.9	638.7	648.7	1.03	1.04	1.05	UP
Denmark	1052.3	1081.4	1133.0	1180.3	1.03	1.08	1.12	UP
Germany	564.8	599.4	631.4	663.3	1.06	1.12	1.17	UP
Estonia	1540.5	1609.8	1830.4	2027.8	1.04	1.19	1.32	UP
Ireland	961.3	985.7	1005.2	1021.4	1.03	1.05	1.06	UP
Greece	627.7	732.1	809.1	891.7	1.17	1.29	1.42	UP
Spain	572.9	581.3	591.8	602.5	1.01	1.03	1.05	UP
France	835.2	845.4	849.1	853.5	1.01	1.02	1.02	UP
Italy	471.5	495.0	519.9	544.5	1.05	1.10	1.15	UP
Latvia	1297.2	1385.1	1584.8	1766.1	1.07	1.22	1.36	UP
Lithuania	1053.1	1141.9	1277.5	1414.8	1.08	1.21	1.34	UP
Luxembourg	511.7	554.8	543.0	534.7	1.08	1.06	1.04	UP
Hungary	704.3	811.9	858.6	916.7	1.15	1.22	1.30	UP
Netherlands	471.6	470.3	489.2	504.4	1.00	1.04	1.07	UP
Austria	703.6	756.5	800.2	844.5	1.08	1.14	1.20	UP
Poland	623.9	664.4	724.4	780.3	1.06	1.16	1.25	UP
Portugal	621.2	700.2	748.7	802.5	1.13	1.21	1.29	UP
Slovenia	609.2	635.0	663.4	692.7	1.04	1.09	1.14	UP
Slovakia	536.2	631.1	670.9	721.1	1.18	1.25	1.34	UP
Finland	2458.7	2555.0	2749.1	2924.7	1.04	1.12	1.19	UP
Sweden	2343.8	2431.6	2772.5	3068.3	1.04	1.18	1.31	UP

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 6. SDG 11(60)—Recycling rate of municipal waste (% of total waste generated).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	44.9	48.9	53.8	58.8	1.09	1.20	1.31	UP
Belgium	53.5	51.4	53.8	53.7	0.96	1.01	1.00	NONE
Bulgaria	29.4	35.2	37.4	41.6	1.20	1.27	1.41	UP
Czech Republic	29.7	40.5	50.8	62.1	1.36	1.71	2.09	UP
Denmark	47.4	45.0	54.8	58.7	0.95	1.16	1.24	UP
Germany	66.7	70.3	71.3	74.0	1.05	1.07	1.11	UP
Estonia	28.3	28.9	36.3	41.7	1.02	1.28	1.47	UP
Ireland	39.6	40.8	42.3	44.2	1.03	1.07	1.12	UP
Greece	15.8	18.9	21.0	22.6	1.20	1.33	1.43	UP
Spain	30.0	40.5	43.1	48.2	1.35	1.44	1.61	UP
France	40.7	41.7	45.2	48.0	1.02	1.11	1.18	UP
Croatia	18.0	29.5	42.2	54.1	1.64	2.34	3.01	UP
Italy	44.3	51.4	61.8	71.2	1.16	1.40	1.61	UP
Cyprus	16.6	16.6	19.6	22.1	1.00	1.18	1.33	UP
Latvia	28.7	39.7	53.6	68.0	1.38	1.87	2.37	UP
Lithuania	33.2	45.3	70.1	88.2	1.36	2.11	2.66	UP
Luxembourg	47.4	52.8	54.9	58.1	1.11	1.16	1.23	UP
Hungary	32.2	32.0	43.9	50.9	0.99	1.36	1.58	UP
Malta	10.9	10.9	10.6	10.9	1.00	0.97	1.00	NONE
Netherlands	51.8	56.9	61.6	66.2	1.10	1.19	1.28	UP
Austria	56.9	62.3	61.5	63.1	1.09	1.08	1.11	UP
Poland	32.5	38.7	53.5	67.3	1.19	1.65	2.07	UP
Portugal	29.8	26.8	34.6	38.4	0.90	1.16	1.29	UP
Romania	13.3	11.9	18.9	22.9	0.89	1.42	1.72	UP
Slovenia	54.1	59.3	79.3	95.8	1.10	1.47	1.77	UP
Slovakia	14.9	45.3	61.4	80.9	3.04	4.12	5.43	UP
Finland	40.6	42.1	47.3	52.2	1.04	1.17	1.29	UP
Sweden	47.6	48.0	47.2	47.1	1.01	0.99	0.99	NONE

Source: Eurostat, own calculations.

Table 7. SDG 12(21)—Raw material consumption (RMC) (tonnes per capita).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	14.011	13.654	13.540	13.161	0.97	0.97	0.94	DOWN
Belgium	14.526	12.985	12.888	12.341	0.89	0.89	0.85	DOWN
Bulgaria	18.901	20.68	24.724	28.065	1.09	1.31	1.48	UP
Czech Republic	16.774	16.136	17.709	18.317	0.96	1.06	1.09	UP
Denmark	22.188	25.582	27.069	29.400	1.15	1.22	1.33	UP
Germany	15.389	15.069	15.292	14.955	0.98	0.99	0.97	NONE
Estonia	24.167	28.886	30.857	33.290	1.20	1.28	1.38	UP
Ireland	10.681	10.188	12.317	12.599	0.95	1.15	1.18	UP
Greece	14.078	11.439	8.028	4.953	0.81	0.57	0.35	DOWN
Spain	9.602	10.04	8.347	7.305	1.05	0.87	0.76	DOWN
France	12.755	12.699	12.883	12.595	1.00	1.01	0.99	NONE
Croatia	12.499	13.085	13.979	14.500	1.05	1.12	1.16	UP
Italy	11.194	10.228	8.303	6.481	0.91	0.74	0.58	DOWN
Cyprus	19.853	23.053	18.129	15.547	1.16	0.91	0.78	DOWN
Latvia	15.929	18.006	20.735	23.419	1.13	1.30	1.47	UP
Lithuania	16.568	21.863	25.316	29.042	1.32	1.53	1.75	UP
Luxembourg	32.595	24.703	22.934	19.382	0.76	0.70	0.59	DOWN
Hungary	12.344	14.632	19.409	23.119	1.19	1.57	1.87	UP
Malta	13.731	13.548	11.058	10.616	0.99	0.81	0.77	DOWN
Netherlands	9.654	8.163	7.474	6.930	0.85	0.77	0.72	DOWN
Austria	23.363	20.222	20.672	19.128	0.87	0.88	0.82	DOWN
Poland	16.314	18.004	19.140	20.069	1.10	1.17	1.23	UP
Portugal	16.056	15.615	14.644	13.644	0.97	0.91	0.85	DOWN
Romania	22.313	30.401	34.707	41.359	1.36	1.56	1.85	UP
Slovenia	15.847	16.908	14.648	13.757	1.07	0.92	0.87	DOWN
Slovakia	12.916	13.282	11.458	9.928	1.03	0.89	0.77	DOWN
Finland	42.236	45.487	43.321	42.033	1.08	1.03	1.00	NONE
Sweden	23.264	24.79	25.427	25.736	1.07	1.09	1.11	UP

Source: Eurostat, own calculations.

Table 8. SDG 12(30)—Average CO₂ emissions per km from new passenger cars (g CO₂ per km).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	119.1	107.9	95.9	81.0	0.91	0.81	0.68	DOWN
Belgium	117.9	107.7	98.1	85.3	0.91	0.83	0.72	DOWN
Bulgaria	130.3	121.5	106.4	89.3	0.93	0.82	0.69	DOWN
Czech Republic	126.3	120.6	110.4	98.5	0.95	0.87	0.78	DOWN
Denmark	106.2	95.4	76.0	57.1	0.90	0.72	0.54	DOWN
Germany	128.3	113.5	98.7	81.0	0.88	0.77	0.63	DOWN
Estonia	137.2	121.0	106.7	88.0	0.88	0.78	0.64	DOWN
Ireland	114.1	106.1	86.9	69.8	0.93	0.76	0.61	DOWN
Greece	106.4	107.3	82.5	63.1	1.01	0.78	0.59	DOWN
Spain	115.3	111.1	100.3	88.1	0.96	0.87	0.76	DOWN
France	111.0	98.5	88.9	74.7	0.89	0.80	0.67	DOWN
Croatia	112.8	111.7	108.0	103.3	0.99	0.96	0.92	DOWN
Italy	115.2	108.3	100.6	89.8	0.94	0.87	0.78	DOWN
Cyprus	125.7	125.1	107.1	91.9	1.00	0.85	0.73	DOWN
Latvia	137.1	119.4	101.6	80.8	0.87	0.74	0.59	DOWN
Lithuania	130.0	119.3	104.6	87.7	0.92	0.80	0.67	DOWN
Luxembourg	127.5	119.7	107.1	93.4	0.94	0.84	0.73	DOWN
Hungary	129.6	116.6	111.4	99.9	0.90	0.86	0.77	DOWN
Malta	113.3	105.1	85.7	70.1	0.93	0.76	0.62	DOWN
Netherlands	101.2	85.7	64.1	39.7	0.85	0.63	0.39	DOWN
Austria	123.7	112.3	97.3	81.2	0.91	0.79	0.66	DOWN
Poland	129.3	121.7	115.4	105.3	0.94	0.89	0.81	DOWN
Portugal	105.7	97.5	84.7	70.5	0.92	0.80	0.67	DOWN
Romania	125.0	115.4	102.1	87.6	0.92	0.82	0.70	DOWN
Slovenia	119.2	114.2	102.9	89.8	0.96	0.86	0.75	DOWN
Slovakia	127.6	120.2	116.1	106.8	0.94	0.91	0.84	DOWN
Finland	123.0	99.6	77.2	52.3	0.81	0.63	0.43	DOWN
Sweden	126.3	93.5	72.4	44.4	0.74	0.57	0.35	DOWN

Source: Eurostat, own calculations.

Table 9. SDG 12(41)—Circular material use rate (% of material input for domestic use).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	11.3	11.7	12.4	13.0	1.04	1.10	1.15	UP
Belgium	17.7	21.5	25.2	29.0	1.21	1.42	1.64	UP
Bulgaria	3.1	5.9	5.6	6.9	1.90	1.81	2.23	UP
Czech Republic	6.9	11.6	14.4	17.6	1.68	2.09	2.55	UP
Denmark	8.3	7.5	8.1	8.2	0.90	0.98	0.99	NONE
Germany	12.0	12.9	13.6	14.6	1.08	1.13	1.22	UP
Estonia	11.3	15.6	15.4	16.4	1.38	1.36	1.45	UP
Ireland	1.9	1.7	1.7	1.7	0.89	0.89	0.89	NONE
Greece	1.9	4.4	4.5	5.5	2.32	2.37	2.89	UP
Spain	7.5	9.3	8.0	7.5	1.24	1.07	1.00	NONE
France	18.7	19.2	21.3	22.8	1.03	1.14	1.22	UP
Croatia	4.6	5.7	7.4	9.1	1.24	1.61	1.98	UP
Italy	17.2	20.6	23.9	27.7	1.20	1.39	1.61	UP
Cyprus	2.4	3.7	3.6	4.2	1.54	1.50	1.75	UP
Latvia	5.3	5.1	7.7	9.5	0.96	1.45	1.79	UP
Lithuania	4.1	4.0	4.4	4.7	0.98	1.07	1.15	UP
Luxembourg	9.7	9.9	10.3	10.5	1.02	1.06	1.08	UP
Hungary	5.8	5.2	7.2	7.8	0.90	1.24	1.34	UP
Malta	4.6	13.3	12.9	16.1	2.89	2.80	3.50	UP
Netherlands	25.8	30.0	34.2	37.4	1.16	1.33	1.45	UP
Austria	10.7	10.8	14.7	17.2	1.01	1.37	1.61	UP
Poland	11.6	7.5	8.4	7.5	0.65	0.72	0.65	NONE
Portugal	2.1	2.3	2.6	2.8	1.10	1.24	1.33	UP
Romania	1.7	1.5	1.1	1.1	0.88	0.65	0.65	NONE
Slovenia	8.6	9.9	12.5	14.2	1.15	1.45	1.65	UP
Slovakia	5.1	10.5	9.2	11.1	2.06	1.80	2.18	UP
Finland	6.4	5.9	7.1	8.1	0.92	1.11	1.27	UP
Sweden	6.7	6.8	6.5	6.4	1.01	0.97	0.96	NONE

Source: Eurostat, own calculations.

Table 10. SDG 12(51)—Generation of waste (kg per capita).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	4988	4815	4956	4915	0.97	0.99	0.99	DOWN
Belgium	5074	5899	6014	6262	1.16	1.19	1.23	UP
Bulgaria	22,869	16,785	15,369	13,093	0.73	0.67	0.57	DOWN
Czech Republic	2000	3598	3337	3596	1.80	1.67	1.80	UP
Denmark	3679	3453	4224	4644	0.94	1.15	1.26	UP
Germany	4754	4824	5077	5246	1.01	1.07	1.10	UP
Estonia	16,621	12,163	16,360	16,684	0.73	0.98	1.00	NONE
Ireland	2023	3248	1569	1356	1.61	0.78	0.67	DOWN
Greece	7792	2651	5001	4926	0.34	0.64	0.63	DOWN
Spain	2041	2230	1895	1495	1.09	0.93	0.73	DOWN
France	5300	4593	4840	4770	0.87	0.91	0.90	DOWN
Croatia	1286	1483	1198	1211	1.15	0.93	0.94	DOWN
Italy	2695	2942	2925	3003	1.09	1.09	1.11	UP
Cyprus	2232	2491	2623	2672	1.12	1.18	1.20	UP
Latvia	1345	1501	1524	1741	1.12	1.13	1.29	UP
Lithuania	1957	2396	2555	2724	1.22	1.31	1.39	UP
Luxembourg	14,243	14,618	12,960	11,479	1.03	0.91	0.81	DOWN
Hungary	1343	1759	1429	1269	1.31	1.06	0.94	NONE
Malta	1837	6847	4058	3617	3.73	2.21	1.97	UP
Netherlands	8266	7175	9057	9795	0.87	1.10	1.18	UP
Austria	5923	7728	7618	7992	1.30	1.29	1.35	UP
Poland	4751	4492	5145	5486	0.95	1.08	1.15	UP
Portugal	1404	1612	1585	1651	1.15	1.13	1.18	UP
Romania	7078	7338	4857	2421	1.04	0.69	0.34	DOWN
Slovenia	2128	3576	3463	3683	1.68	1.63	1.73	UP
Slovakia	1402	2340	2002	1989	1.67	1.43	1.42	NONE
Finland	19,571	20,993	25,840	28,812	1.07	1.32	1.47	UP
Sweden	18,320	14,664	17,733	19,478	0.80	0.97	1.06	UP

Source: Eurostat, own calculations.

Table 11. SDG 13(10)—Greenhouse gas emissions (index, 1990 = 100).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	76.4	66.2	70.0	66.0	0.87	0.92	0.86	DOWN
Belgium	83.9	75.7	76.6	71.9	0.90	0.91	0.86	DOWN
Bulgaria	64.0	46.8	50.0	47.1	0.73	0.78	0.74	DOWN
Czech Republic	63.9	65.0	59.1	55.4	1.02	0.92	0.87	DOWN
Denmark	66.3	58.5	55.9	46.9	0.88	0.84	0.71	DOWN
Germany	70.1	57.6	58.6	53.7	0.82	0.84	0.77	DOWN
Estonia	47.3	38.1	38.8	36.2	0.81	0.82	0.77	DOWN
Ireland	112.4	107.3	118.3	119.1	0.95	1.05	1.06	UP
Greece	90.8	68.5	91.3	87.2	0.75	1.01	0.96	NONE
Spain	117.5	90.7	122.3	122.2	0.77	1.04	1.04	UP
France	82.0	71.4	75.6	71.2	0.87	0.92	0.87	DOWN
Croatia	75.2	71.8	84.6	86.6	0.95	1.13	1.15	UP
Italy	78.8	68.2	76.1	71.4	0.87	0.97	0.91	NONE
Cyprus	142.6	138.4	167.9	174.0	0.97	1.18	1.22	UP
Latvia	81.0	82.6	85.5	96.9	1.02	1.06	1.20	UP
Lithuania	28.9	31.8	16.0	9.8	1.10	0.55	0.34	DOWN
Luxembourg	86.3	77.9	89.7	89.6	0.90	1.04	1.04	UP
Hungary	61.9	61.0	55.2	50.2	0.99	0.89	0.81	DOWN
Malta	88.3	82.2	96.1	93.1	0.93	1.09	1.05	UP
Netherlands	90.5	75.2	80.7	76.6	0.83	0.89	0.85	DOWN
Austria	110.0	103.0	119.7	123.3	0.94	1.09	1.12	UP
Poland	79.8	79.3	74.7	71.8	0.99	0.94	0.90	DOWN
Portugal	99.2	80.6	105.0	105.7	0.81	1.06	1.07	UP
Romania	29.4	26.9	15.6	6.8	0.91	0.53	0.23	DOWN
Slovenia	123.1	89.0	109.5	112.6	0.72	0.89	0.91	NONE
Slovakia	54.7	45.8	47.0	42.7	0.84	0.86	0.78	DOWN
Finland	86.8	85.2	101.7	102.2	0.98	1.17	1.18	NONE
Sweden	35.3	22.1	17.5	2.7	0.63	0.50	0.08	DOWN

Source: Eurostat, own calculations.

Table 12. SDG 13(21)—Net greenhouse gas emissions of the Land use, Land use change and Forestry (LULUCF) sector (tonnes per square kilometer).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	−71.7	−54.3	−59.9	−56.2	0.76	0.84	0.78	UP
Belgium	−27.7	−11.0	4.3	17.5	N/A	N/A	N/A	UP
Bulgaria	−72.8	−86.5	−49.0	−29.2	1.19	0.67	0.40	UP
Czech Republic	−84.7	161.9	60.5	103.1	N/A	N/A	N/A	UP
Denmark	18.5	72.4	11.7	−11.2	N/A	N/A	N/A	DOWN
Germany	−57.1	−31.5	−85.5	−103.5	0.55	1.50	1.81	DOWN
Estonia	−46.9	28.6	5.6	28.2	N/A	N/A	N/A	UP
Ireland	103.9	99.0	89.5	84.3	0.95	0.86	0.81	DOWN
Greece	−28.2	−30.0	−26.8	−28.6	1.06	0.95	1.01	NONE
Spain	−75.0	−70.3	−69.5	−68.0	0.94	0.93	0.91	UP
France	−54.2	−21.9	−27.4	−18.4	0.40	0.51	0.34	UP
Croatia	−95.9	−93.8	−75.3	−63.1	0.98	0.79	0.66	UP
Italy	−142.7	−107.3	−128.3	−134.6	0.75	0.90	0.94	NONE
Cyprus	−38.6	−37.7	−40.0	−43.2	0.98	1.04	1.12	DOWN
Latvia	2.9	10.0	65.4	110.6	3.45	22.55	38.14	UP
Lithuania	−120.2	−82.8	−113.9	−115.5	0.69	0.95	0.96	NONE
Luxembourg	−135.2	−129.8	−59.2	−29.4	0.96	0.44	0.22	UP
Hungary	−60.8	−73.4	−69.9	−78.0	1.21	1.15	1.28	DOWN
Malta	−12.0	−7.0	−17.7	−25.7	0.58	1.48	2.14	DOWN
Netherlands	120.9	94.5	91.1	79.6	0.75	0.75	0.66	DOWN
Austria	−26.2	−14.9	49.8	89.5	N/A	N/A	N/A	UP
Poland	−98.7	−67.2	−94.6	−86.2	0.68	0.96	0.87	NONE
Portugal	−94.6	−73.7	−66.3	−64.6	0.78	0.70	0.68	UP
Romania	−138.3	−138.0	−133.2	−133.8	1.00	0.96	0.97	NONE
Slovenia	35.2	−233.6	24.9	113.3	N/A	N/A	N/A	NONE
Slovakia	−145.8	−178.4	−119.9	−105.3	1.22	0.82	0.72	NONE
Finland	−55.4	−51.1	−48.3	−45.5	0.92	0.87	0.82	UP
Sweden	−86.0	−88.9	−84.9	−84.0	1.03	0.99	0.98	NONE

Source: Eurostat, own calculations.

Table 13. SDG 14(40)—Bathing sites with excellent water quality (%).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	87.0	88.4	91.6	94.4	1.02	1.05	1.09	UP
Belgium	76.2	95.1	100.0	100.0	1.25	1.31	1.31	UP
Bulgaria	70.0	63.0	83.8	94.2	0.90	1.20	1.35	UP
Denmark	84.5	90.4	100.0	100.0	1.07	1.18	1.18	UP
Germany	76.3	83.5	89.6	94.3	1.09	1.17	1.24	UP
Estonia	40.7	48.3	53.7	57.5	1.19	1.32	1.41	UP
Ireland	72.7	74.1	72.7	71.6	1.02	1.00	0.98	NONE
Greece	97.2	97.1	97.7	98.7	1.00	1.01	1.02	UP
Spain	87.1	93.4	97.5	100.0	1.07	1.12	1.15	UP
France	78.5	79.4	85.0	89.8	1.01	1.08	1.14	UP
Croatia	96.6	98.8	99.2	100.0	1.02	1.03	1.04	UP
Italy	90.4	88.7	90.9	92.1	0.98	1.01	1.02	UP
Cyprus	99.1	100.0	96.8	95.7	1.01	0.98	0.97	DOWN
Latvia	69.7	69.7	100.0	100.0	1.00	1.43	1.43	UP
Lithuania	87.5	93.8	95.7	100.0	1.07	1.09	1.14	UP
Malta	97.7	96.6	95.9	94.8	0.99	0.98	0.97	DOWN
Netherlands	75.8	75.8	85.1	90.2	1.00	1.12	1.19	UP
Poland	55.4	30.7	46.9	54.2	0.55	0.85	0.98	NONE
Portugal	89.6	93.3	94.2	96.0	1.04	1.05	1.07	UP
Romania	30.6	71.4	97.0	100.0	2.33	3.17	3.27	UP
Slovenia	100.0	95.2	95.0	93.2	0.95	0.95	0.93	DOWN
Finland	62.3	71.8	68.6	69.7	1.15	1.10	1.12	UP
Sweden	56.9	77.4	77.9	87.2	1.36	1.37	1.53	UP

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 14. SDG 14(60)—Marine waters affected by eutrophication (square kilometer).

Countries [†]	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	29,031	10,628	37,117	48,336	0.37	1.28	1.66	UP
Belgium	0	0	0	0	1.00	1.00	1.00	NONE
Bulgaria	7	0	2	1	0.00	0.29	0.14	DOWN
Denmark	748	32	333	417	0.04	0.45	0.56	DOWN
Germany	0	860	215	283	N/A	N/A	N/A	NONE
Estonia	106	106	120	130	1.00	1.13	1.23	UP
Ireland	0	0	96	138	N/A	N/A	N/A	UP
Greece	1063	435	5022	6986	0.41	4.72	6.57	UP
Spain	16,256	4140	11,086	13,763	0.25	0.68	0.85	DOWN
France	139	866	1149	1447	6.23	8.27	10.41	UP
Croatia	128	233	167	195	1.82	1.30	1.52	UP
Italy	698	268	315	297	0.38	0.45	0.43	DOWN
Cyprus	30	20	32	40	0.67	1.07	1.33	UP
Latvia	42	48	49	58	1.14	1.17	1.38	UP
Lithuania	8	15	18	21	1.88	2.25	2.63	UP
Malta	11	0	0	0	0.00	0.00	0.00	DOWN
Netherlands	0	0	538	755	N/A	N/A	N/A	UP
Poland	30	66	41	48	2.20	1.37	1.60	UP
Portugal	8816	2247	16,066	21,290	0.25	1.82	2.41	UP
Romania	21	0	1	0	0.00	0.05	0.00	DOWN
Slovenia	1	0	1	1	0.00	1.00	1.00	NONE
Finland	304	543	752	988	1.79	2.47	3.25	UP
Sweden	624	749	1114	1480	1.20	1.79	2.37	UP

Source: Eurostat, own calculations. [†] Countries omitted from the table lacked sufficient published data for inclusion in this analysis.

Table 15. SDG 15(20)—Surface of the terrestrial protected areas (%).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	18	26	27	32	1.44	1.50	1.78	UP
Belgium	13	15	15	16	1.15	1.15	1.23	UP
Bulgaria	34	41	42	47	1.21	1.24	1.38	UP
Czech Republic	14	22	23	28	1.57	1.64	2.00	UP
Denmark	8	15	16	20	1.88	2.00	2.50	UP
Germany	15	37	41	54	2.47	2.73	3.60	UP
Estonia	18	21	21	23	1.17	1.17	1.28	UP
Ireland	13	14	14	15	1.08	1.08	1.15	UP
Greece	27	35	36	41	1.30	1.33	1.52	UP
Spain	27	28	28	29	1.04	1.04	1.07	UP
France	13	28	30	39	2.15	2.31	3.00	UP
Croatia	37	38	38	39	1.03	1.03	1.05	UP
Italy	19	21	22	23	1.11	1.16	1.21	UP
Cyprus	29	38	40	45	1.31	1.38	1.55	UP
Latvia	12	18	19	23	1.50	1.58	1.92	UP
Lithuania	12	17	18	21	1.42	1.50	1.75	UP
Luxembourg	27	52	64	85	1.93	2.37	3.15	UP
Hungary	21	22	22	23	1.05	1.05	1.10	UP
Malta	13	29	31	41	2.23	2.38	3.15	UP
Netherlands	15	27	28	35	1.80	1.87	2.33	UP
Austria	15	29	31	40	1.93	2.07	2.67	UP
Poland	20	40	43	54	2.00	2.15	2.70	UP
Portugal	21	22	23	23	1.05	1.10	1.10	UP
Romania	23	24	24	24	1.04	1.04	1.04	UP
Slovenia	38	41	41	42	1.08	1.08	1.11	UP
Slovakia	29	37	39	45	1.28	1.34	1.55	UP
Finland	13	13	13	13	1.00	1.00	1.00	NONE
Sweden	12	14	14	15	1.17	1.17	1.25	UP

Source: Eurostat, own calculations.

Table 16. SDG 15(41)—Soil sealing index (index, 2006 = 100).

Countries	2015	2020	2025	2030	2020/2015	2025/2015	2030/2015	Trend
EU-27	104.5	109.0	112.0	115.2	1.04	1.07	1.10	UP
Belgium	102.7	106.8	108.9	111.3	1.04	1.06	1.08	UP
Bulgaria	104.5	107.8	110.6	113.5	1.03	1.06	1.09	UP
Czech Republic	103.4	107.1	109.3	111.8	1.04	1.06	1.08	UP
Denmark	103.3	108.1	110.6	113.5	1.05	1.07	1.10	UP
Germany	103.2	106.5	108.6	111.0	1.03	1.05	1.08	UP
Estonia	105.3	110.4	113.8	117.5	1.05	1.08	1.12	UP
Ireland	103.4	108.3	110.8	113.7	1.05	1.07	1.10	UP
Greece	103.7	109.7	112.7	116.3	1.06	1.09	1.12	UP
Spain	107.2	112.2	116.3	120.4	1.05	1.08	1.12	UP
France	105.0	110.0	113.2	116.7	1.05	1.08	1.11	UP
Croatia	103.7	107.8	110.3	113.1	1.04	1.06	1.09	UP
Italy	103.1	106.8	109.0	111.4	1.04	1.06	1.08	UP
Cyprus	113.7	125.2	133.8	143.1	1.10	1.18	1.26	UP
Latvia	103.3	109.5	112.3	115.8	1.06	1.09	1.12	UP
Lithuania	102.9	107.9	110.3	113.2	1.05	1.07	1.10	UP
Luxembourg	105.6	112.1	115.9	120.1	1.06	1.10	1.14	UP
Hungary	105.2	109.3	112.5	115.9	1.04	1.07	1.10	UP
Malta	100.8	105.6	107.1	109.3	1.05	1.06	1.08	UP
Netherlands	103.7	108.4	111.0	114.0	1.05	1.07	1.10	UP
Austria	103.3	107.2	109.5	112.1	1.04	1.06	1.09	UP
Poland	108.7	115.8	121.3	127.2	1.07	1.12	1.17	UP
Portugal	104.3	109.0	111.9	115.1	1.05	1.07	1.10	UP
Romania	106.0	110.5	114.2	118.0	1.04	1.08	1.11	UP
Slovenia	103.8	106.7	108.9	111.1	1.03	1.05	1.07	UP
Slovakia	106.3	111.1	114.9	118.9	1.05	1.08	1.12	UP
Finland	103.7	108.2	110.9	113.9	1.04	1.07	1.10	UP
Sweden	103.4	112.1	115.5	120.0	1.08	1.12	1.16	UP

Source: Eurostat, own calculations.

Biochemical oxygen demand assumes a pivotal role as an indicator within the SDG framework. This indicator quantifies the dissolved oxygen consumed by microorganisms during organic matter decomposition in water, offering insights into the environmental health and pollution status of rivers and water bodies. Elevated BOD levels signify pollution, while depleted oxygen levels can harm aquatic ecosystems and human health, aligning with multiple SDGs, including those addressing life below water and good health.

Monitoring nitrate levels in groundwater is crucial because of its sentinel role for water quality and its far-reaching implications. High nitrate concentrations, often resulting from human activities such as agriculture and waste disposal, indicate potential contamination and can pose serious health risks, particularly for infants, in line with the SDG 3 goal of good health. In addition, high nitrate levels can contribute to eutrophication and harm aquatic ecosystems, which is consistent with SDG 14 on the conservation of marine resources. Thus, nitrate monitoring links several SDGs, highlighting the interlinkage between sustainable development goals and the need for responsible groundwater management.

Phosphate levels in rivers are a critical environmental parameter due to their profound impact on aquatic ecosystems and water quality. Phosphates, which often come from agricultural runoff and wastewater discharges, are a major cause of eutrophication, leading to excessive algal growth and oxygen depletion in water bodies. Monitoring phosphate concentrations in rivers is essential for assessing and mitigating nutrient pollution, preserving aquatic biodiversity and protecting water resources. In addition, monitoring phosphate levels also aligns with SDG 6 and SDG 14 priorities.

The WEI+ index helps to assess the extent to which water resources are being used within a specific region. This information is vital for effective water resource management, as it indicates whether water use is sustainable or if it exceeds the available supply. Sustainable water use is central to achieving SDG 6. Excessive water exploitation can lead to environmental problems, such as the depletion of aquifers, reduced river flow, and harm to aquatic ecosystems.

The amount of land occupied per capita can impact water management practices, as well as energy infrastructure and efficiency. Sustainable land use contributes to better water conservation and reduces the environmental footprint associated with energy production and distribution, aligning with SDG 6 and SDG 7.

Environmental conservation is vital for preserving the planet's delicate ecological balance and ensuring the well-being of current and future generations. The management of municipal waste plays a pivotal role in this endeavor. By reducing waste sent to landfills and incinerators, we not only minimize the environmental and health hazards associated with these methods but also conserve valuable resources, reduce energy consumption, lower greenhouse gas emissions, and promote a circular economy.

Raw materials consumption is seen as a key element in achieving a more sustainable and interconnected future, as envisaged by the SDGs. By promoting resource efficiency and reducing consumption of raw materials, we promote responsible consumption and production (SDG 12), reduce waste generation, reduce energy consumption and greenhouse gas emissions (SDG 13), protect ecosystems and biodiversity (SDG 15), support economic growth and employment (SDG 8) and encourage a circular economy (SDG 9). In addition, promoting resource efficiency encourages responsible consumer behavior, conserves water resources (SDG 6) and exemplifies the need for global collaboration (SDG 17).

The SDG 12(30) indicator needs no further explanation, with extremely consistent efforts from the European Commission and all stakeholders being dedicated to reducing CO₂ emissions from passenger cars. As our research results show, the expected trend of this indicator is unanimously downwards until 2030.

The circular material use rate is relevant due to its substantial impact on resource efficiency, waste reduction, carbon emissions reduction, economic growth, responsible consumption, habitat preservation, water conservation, supply chain sustainability, and the necessity for global cooperation in achieving sustainability and the SDGs. Circular material

use represents a holistic approach to resource management and responsible production and consumption.

High levels of waste generation, often linked to unsustainable consumption and production patterns, pose environmental and health hazards. Mitigating waste generation and promoting recycling and reuse not only reduce the burden of landfill and incineration, encouraging responsible waste management (SDG 11), but also conserve resources, mitigate carbon emissions (SDG 13), support economic growth and decent work (SDG 8), and align with the principles of a circular economy (SDG 9).

Analyzing the results obtained, we can notice that, at least at the level of the trend manifested by the average value of this indicator at EU level, the forecast trend is downward. However, the results of the individual forecasts for the EU countries suggest the existence of mixed forecast trends, with a reduction in the generation of waste expected for eight Member States, while an increase in the generation of waste is expected for sixteen European countries. It is clear that much more attention than has been paid so far is needed to reduce the amount of waste generated, given the worrying forecasts on the evolution of this indicator, which poses environmental and health hazards.

Greenhouse gas emissions represent a critical environmental concern, as they are intrinsically linked to climate change, a global challenge with far-reaching consequences. Addressing greenhouse gas emissions is instrumental in achieving broader SDGs related to health, poverty eradication, economic growth, and overall environmental and social well-being, making it a linchpin in the global effort to create a more sustainable and resilient future.

The net greenhouse gas emissions of LULUCF are highly relevant to this research because they directly influence climate change mitigation, biodiversity conservation, water management, rural livelihoods, energy, and infrastructure development, natural resource management, resilience, and the necessity for global cooperation in achieving targets for SDG indicators. Addressing emissions and promoting sustainable practices within this sector is integral to the broader effort to create a more sustainable and climate-resilient society.

Bathing sites with excellent water quality are environmentally relevant due to their positive impact on human health, environmental preservation, and local economies. Maintaining excellent water quality at bathing sites minimizes pollution and contamination that can harm aquatic life and their habitats, contributing to biodiversity conservation.

Eutrophication, often caused by excessive nutrient runoff, leads to algal blooms, oxygen depletion, and disruptions in marine ecosystems, impacting biodiversity and the preservation of marine life. Also, eutrophication exacerbates ocean acidification, impacting marine species and their ability to adapt to climate change.

Forests and other natural habitats within protected areas play a crucial role in sequestering carbon dioxide, contributing to climate change mitigation. At the same time, these areas can positively influence air and water quality, enhancing overall environmental health, proving to be a cornerstone of global efforts to balance human needs with the imperative of preserving natural ecosystems and the diverse life they support.

The Soil Sealing Index underscores the intricate interconnectedness of environmental and sustainability goals by highlighting the multidimensional impact of soil sealing on various facets of sustainable development. It exemplifies how actions in one area can ripple through multiple dimensions of environmental and social well-being, underscoring the interdependence of these goals. The loss of natural land to soil sealing threatens biodiversity, endangers ecosystem services (such as clean water and carbon sequestration), and disrupts local climates. It underscores the need for integrated and holistic approaches to sustainable development that account for the intricate relationships between environmental, social, and economic dimensions.

In order to get a broader perspective on the level of the implementation of the 2030 Agenda in the EU countries as well as their potential to reach the environmental sustainability targets assumed, Table 17 summarizes the main projected developments up to 2030 for each specific indicator included in the analysis.

Table 17. Estimated trends for key SDG environmental indicators towards 2030.

Countries	SDG 6(30)	SDG 6(40)	SDG 6(50)	SDG 6(60)	SDG 11(31)	SDG 11(60)	SDG 12(21)	SDG 12(30)	SDG 12(41)	SDG 12(51)	SDG 13(10)	SDG 13(21)	SDG 14(40)	SDG 14(60)	SDG 15(20)	SDG 15(41)
EU-27	↘	↘	→	↘	↗	↗	↘	↘	↗	↘	↘	↗	↗	↗	↗	↗
Belgium	↘	↘	↗	↘	↗	→	↘	↘	↗	↗	↘	↗	↗	→	↗	↗
Bulgaria	↘	↗	↘	↘	↗	↗	↗	↘	↗	↘	↘	↗	↗	↘	↗	↗
Czech Republic	↘	↘	→	→	↗	↗	↗	↘	↗	↗	↘	↗	n.a.	n.a.	↗	↗
Denmark	n.a.	n.a.	n.a.	↗	↗	↗	↗	↘	→	↗	↘	↘	↗	↘	↗	↗
Germany	n.a.	↗	n.a.	↘	↗	↗	→	↘	↗	↗	↘	↘	↗	→	↗	↗
Estonia	↘	↗	↘	↘	↗	↗	↗	↘	↗	→	↘	↗	↗	↗	↗	↗
Ireland	↘	↗	→	→	↗	↗	↗	↘	→	↘	↗	↘	→	↗	↗	↗
Greece	n.a.	n.a.	n.a.	↘	↗	↗	↘	↘	↗	↘	→	→	↗	↗	↗	↗
Spain	↘	n.a.	n.a.	↘	↗	↗	↘	↘	→	↘	↗	↗	↗	↘	↗	↗
France	n.a.	↘	→	↘	↗	↗	→	↘	↗	↘	↘	↗	↗	↗	↗	↗
Croatia	↘	↘	↘	→	↗	↗	↗	↘	↗	↘	↗	↗	↗	↗	↗	↗
Italy	↘	n.a.	n.a.	↘	↗	↗	↘	↘	↗	↗	→	→	↗	↘	↗	↗
Cyprus	→	n.a.	n.a.	↘	↗	↗	↘	↘	↗	↗	↗	↘	↘	↗	↗	↗
Latvia	↘	↗	↘	↘	↗	↗	↗	↘	↗	↗	↗	↗	↗	↗	↗	↗
Lithuania	↘	n.a.	↗	↘	↗	↗	↗	↘	↗	↗	↘	→	↗	↗	↗	↗
Luxembourg	n.a.	n.a.	n.a.	→	↗	↗	↘	↘	↗	↘	↗	↗	n.a.	n.a.	↗	↗
Hungary	n.a.	n.a.	n.a.	↘	↗	↗	↗	↘	↗	→	↘	↘	n.a.	n.a.	↗	↗
Malta	n.a.	↘	n.a.	↗	↗	→	↘	↘	↗	↗	↗	↘	↘	↘	↗	↗
Netherlands	n.a.	n.a.	n.a.	↗	↗	↗	↘	↘	↗	↗	↘	↘	↗	↗	↗	↗
Austria	→	↘	→	→	↗	↗	↘	↘	↗	↗	↗	↗	n.a.	n.a.	↗	↗
Poland	↘	n.a.	n.a.	→	↗	↗	↗	↘	→	↗	↘	→	→	↗	↗	↗
Portugal	n.a.	→	n.a.	↘	↗	↗	↘	↘	↗	↗	↗	↗	↗	↗	↗	↗
Romania	↘	↘	→	→	↗	↗	↗	↘	→	↘	↘	→	↗	↘	↗	↗
Slovenia	↘	↘	↘	↘	↗	↗	↘	↘	↗	↗	→	→	↘	→	↗	↗
Slovakia	n.a.	n.a.	→	↗	↗	↗	↘	↘	↗	→	↘	→	n.a.	n.a.	↗	↗
Finland	n.a.	n.a.	→	↘	↗	↗	→	↘	↗	↗	→	↗	↗	↗	→	↗
Sweden	n.a.	n.a.	↘	↘	↗	→	↗	↘	→	↗	↘	→	↗	↗	↗	↗

Source: own calculations. “↗” denotes upward trend, “↘” denotes downward trend, “→” denotes no trend, “n.a.” means not available data.

5. Discussion

Analyzing the results of the research, it can be seen that European countries are making sustained efforts to protect the environment and meet the targets set by the 2030 Agenda. However, the results also highlight the existence of potentially unfavorable developments, with potentially significant negative effects on the environment, society and sustainable development.

Biochemical oxygen demand (SDG 6-30) assumes a pivotal role as an indicator within the SDG framework. As our research suggests, the biochemical oxygen demand evolution forecast until 2030 is on a downward trend in the EU countries, with two exceptions (Cyprus and Austria) for which it is estimated to be on a neutral trend, which can easily be turned into a downward trend in the coming years.

Monitoring nitrate levels in groundwater (SDG 6-40) is crucial because of its sentinel role for water quality and its far-reaching implications. The research results show that of the 14 EU countries that reported data for this indicator, nine are on a downward trend in the values of this indicator until 2030. For five countries (Bulgaria, Germany, Estonia, Ireland and Latvia), however, an increase in nitrate concentration is estimated, which should raise a warning sign for stakeholders that urgent measures are needed to correct this projected trend. However, it should be mentioned that Estonia and Latvia have the lowest absolute values of this indicator at the European level, which shows a real concern for environmental protection in these two countries.

Phosphate levels in rivers (SDG 6-50) are a critical environmental parameter due to their profound impact on aquatic ecosystems and water quality. As the results of the

research indicate, the evolution of this indicator at the EU average level does not have a well-defined trend, which is determined by the division of EU countries into two categories: countries with an expected downward trend and countries with an uncertain trend, the two categories containing an almost equal number.

For Belgium and Lithuania, an upward trend of this indicator is estimated, corrective measures being important to be adopted and implemented as soon as possible, as the effects will not be seen for a number of years. The estimated upward trend confirms the results published by Česonienė et al. [74].

The WEI+ index (SDG 6-60) helps to assess the extent to which water resources are being used within a specific region. The results obtained indicate a favorable evolution of this indicator for most EU countries, except for four of them (Denmark, Malta, The Netherlands and Slovakia). It should be taken into account that more and more river sub-basins are affected by seasonal water scarcity, with a tendency to turn into permanent water scarcity [75]. Also, Malta is experiencing permanent water scarcity conditions partly due to its natural hydro-climatic conditions.

The amount of land occupied per capita (SDG 11-31) can impact water management practices, as well as energy infrastructure and efficiency. Unfortunately, as the results indicate, for all 27 Member States, a 20% to 30% increase in settlement area per capita is forecast by 2030, which puts more pressure on the environment. We suggest that urgent and firm measures are needed to control the degradation associated with the evolution of this indicator, which is a prime example of a complete failure to meet the proposed targets.

The management of municipal waste (SDG 11-60) plays a pivotal role in this endeavor. The results obtained indicate, for the vast majority of Member States, a positive development for the horizon analyzed. The three countries for which the research results suggest an indecisive trend (Belgium, Malta and Sweden) do not give any indication of a worsening trend in the future, which leads us to believe that there will be no negative situations in the years to come.

Raw materials consumption (SDG 12-21) is seen as a key element in achieving a more sustainable and interconnected future, as envisaged by the SDGs. Examining the results of the research, it can be seen that at the EU average level, the forecast trend is to reduce the consumption of raw materials by about 6% compared to 2015. The explanations for this modest evolution can be found in the highlighting of the two antagonistic trends that manifest themselves among the EU countries: for 12 countries (predominantly economically developed countries) a downward trend is estimated for this indicator, and for 12 countries an upward trend is forecast until 2030 (most of them being Central and Eastern European countries). Also of particular interest for this analysis is that for the two countries that are considered to form the economic engine of the EU (Germany and France), the results of the analysis indicate the lack of a clear trend, which may be an alarm signal, given that the increasing consumption of raw materials in these economies could reverse the average EU trend from downward to ascending.

Average CO₂ emissions per km from new passenger cars (SDG 12-30) needs no further explanation. It can be said that this indicator is one of the best examples of success, when the combined efforts of all stakeholders can achieve spectacular results in terms of reaching the SDG targets, as well as a high level of environmental protection.

The circular material use rate (SDG 12-41) is relevant due to its substantial impact on resource efficiency, waste reduction, carbon emissions reduction, economic growth, responsible consumption, habitat preservation, water conservation, supply chain sustainability, and the necessity for global cooperation in achieving sustainability and the SDGs. The research results indicate a favorable forecast for most of the European countries considered, including an increase of about 15% in the EU average values between 2015 and 2030. It should be mentioned, however, that for six European countries no upward or downward trend can be estimated. Among these six countries, the situation is slightly worrying for Poland and Romania, for which the estimated results tend to suggest a worsening trend in the values of this indicator, in the absence of firm measures to correct and encourage

the circular material use rate. The results obtained support the research published by Smol et al. [76] and Hondroyiannis et al. [77], who reached the same conclusions.

High levels of waste generation (SDG 12-51), often linked to unsustainable consumption and production patterns, pose environmental and health hazards. Analyzing the results obtained, we can notice that, at least at the level of the trend manifested by the average value of this indicator at EU level, the forecast trend is downward. However, the results of the individual forecasts for the EU countries suggest the existence of mixed forecast trends, with a reduction in the generation of waste expected for eight Member States, while an increase in the generation of waste is expected for sixteen European countries. It is clear that much more attention than has been paid so far is needed to reduce the amount of waste generated, given the worrying forecasts on the evolution of this indicator, which poses environmental and health hazards.

Greenhouse gas emissions (SDG 13-10) represent a critical environmental concern as they are intrinsically linked to climate change, a global challenge with far-reaching consequences. Much of the effort at European and global levels is directed at reducing GHG emissions. As the results of our research show, there is no total success in reducing emissions in the EU countries, with the projected evolution of the values of this indicator showing diverging trends for many European countries. Thus, for fourteen EU countries, the trend of GHG emissions reduction until 2030 is confirmed; however, for nine other EU-European countries, the research results suggest negative developments, i.e., an upward trend of GHG emissions values until 2030 is estimated. This represents a challenge at both national and regional level, and increased efforts are required to address this trend. Unfortunately, these results are supported by previous research published by Mielcarek-Bocheńska and Rzeźnik [78], Verschuuren [79], and Lamb et al. [80].

The net greenhouse gas emissions of LULUCF (SDG 13-21) are highly relevant to this research because they directly influence climate change mitigation, biodiversity conservation, water management, rural livelihoods, energy, and infrastructure development, natural resource management, resilience, and the necessity for global cooperation in achieving targets for SDG indicators. The results of the research, in terms of the evolution of the values of this indicator until 2030, suggest the existence of a fluid situation, which may change over the coming years. Although the baseline analysis forecasts an adverse trend in the evolution of the EU average values, the situation may change in the coming years, in particular due to the efforts being made at the European level, as well as at the level of each Member State, to reduce pollutant emissions while increasing the area under cultivation and implementing intelligent solutions for carbon sequestration. Germany can be mentioned as an example of best practice at EU level, given the results achieved so far as well as the projected future development of this indicator.

Bathing sites with excellent water quality (SDG 14-40) are environmentally relevant due to their positive impact on human health, environmental preservation, and local economies. The results obtained in relation to the evolution of this indicator are encouraging; for the vast majority of the countries included in the analysis, positive developments are expected, i.e., the values are expected to be on an upward trend until 2030. There are only a limited number of EU countries (Cyprus, Malta, Slovenia) for which data analysis suggests the possibility of slight reductions in water quality, but the relatively small deviations can be kept under control by the responsible stakeholders.

Marine waters affected by eutrophication (SDG 14-60) is an important indicator tracked across EU countries. Eutrophication, often caused by excessive nutrient runoff, leads to algal blooms, oxygen depletion, and disruptions in marine ecosystems, impacting biodiversity and the preservation of marine life. Our research also took this indicator into account, and the results obtained were not the most encouraging. Thus, at EU level, a negative development is suggested until 2030 for most of the countries included in the analysis. The eutrophication trend is forecast to intensify, with significant negative effects on the environment and society if strong measures are not taken to protect marine areas and reduce this phenomenon. The research results indicate Portugal, Greece and France as the

main EU countries that will be massively affected by eutrophication. Nor will the Nordic and Baltic countries be spared from eutrophication, but probably to a lesser extent.

Forests and other natural habitats within protected areas (SDG 15-20) play a crucial role in sequestering carbon dioxide, contributing to climate change mitigation. The results of our research indicate a general trend of increasing the terrestrial protected areas in all EU countries by 2030, which represents a real success in terms of the implementation of public policies on environmental protection promoted at European level, but also of the efforts made at the level of each Member State to achieve these positive results.

The Soil Sealing Index (SDG 15-41) underscores the intricate interconnectedness of environmental and sustainability goals by highlighting the multidimensional impact of soil sealing on various facets of sustainable development. In spite of all these reasons that would support a reduction in the values of this indicator over time, the results of our research suggest an increase in sealed soil areas for all EU countries by 2030, on average by about 10%. Strong measures to reduce this phenomenon are urgently needed, as without these measures a worsening of environmental and social conditions is expected in European countries, especially around large urban agglomerations whose inhabitants will suffer increasingly from extreme climate change, with environmental conditions expected to deteriorate significantly.

Although the European Commission has developed since 1973 a series of legislative proposals aimed at protecting the environment and eliminating negative actions on it, there are still many inadequacies both at the level of factors with negative effects and at the level of regions or countries.

As our paper highlights, countries with notable economic performance are to a large extent also countries that perform well in environmental protection actions.

Therefore, we believe that in addition to promoting best practice models in countries with negative trends in environmental indicators towards 2030, it is absolutely necessary to implement specific solutions, through targeted policies and strategies for each country, that can reduce the current gap. In order to clearly highlight them, we identify below a series of policies and/or strategies that can contribute to reducing and eliminating over time the negative effects of human actions on the environment.

Therefore, the strategy to reach the 2030 greenhouse gas emission reduction target can only be achieved by increasing the adaptive capacity of countries to climate change through the development and promotion of those industries that reduce society's vulnerability to climate change.

The promotion of regenerative growth economic models, through the large-scale implementation of the circular economy, can also be one of the policies that can contribute to the decoupling of economic activities from environmental resources, especially non-renewable resources (soil and subsoil resources in particular).

The strategy to achieve the "zero pollution" objective is unquestionably a global and national priority, as the planet already has real shortcomings in terms of human health and well-being, problems caused in particular by air, water and soil pollution. Reducing the pressure generated in particular by energy, industry in general, but also transport and infrastructure, can therefore contribute greatly to restoring biodiversity and improving air, water and soil quality.

Another important direction to follow is the fact that, although minimum standards on environmental protection have been implemented at EU level, they are not mandatory, which is why we believe that moving towards a portfolio of actions and measures that are mandatory for all countries to comply with would contribute to a much faster transition to a green economy, to reducing the gaps between countries in terms of environmental protection and especially to improving standards of healthy living. The inclusion of mandatory criminal penalties for all can also be a strategy with quick, short-term results.

The transition of states to the digitization of the economy, a phenomenon accelerated by the COVID-19 pandemic, can contribute greatly to the rapid identification of all those who commit environmental pollution offences by implementing technological solutions,

database platforms for policymakers and institutions responsible for the enforcement of existing regulations.

6. Conclusions

Environmental SDG indicators are essential tools within the global framework of sustainable development. They serve as a compass, guiding nations and organizations in the pursuit of evidence-based actions to safeguard the planet. For this reason, through our research, we aimed to provide a critical mid-term assessment of the implementation of the 2030 Agenda in EU countries, in terms of the potential to achieve environmental sustainability targets at country level, by selecting the most relevant indicators at European level and estimating their evolution until 2030.

By systematically monitoring the environmental SDGs, policymakers and stakeholders gain essential information about the state of our environment and can calibrate their efforts to address urgent environmental challenges. In addition, the environmental SDGs are intricately interlinked with other sustainable development goals, which magnifies their importance in promoting a harmonious and sustainable future for our planet. As we face the pressing issues of our time, pursuing the environmental SDGs remains a fundamental and non-negotiable imperative, essential for making informed decisions and ensuring the well-being of present and future generations.

The results of our research show a complex picture at EU level, with targets that are likely to be met, but also with indicators for which forecasts indicate the possibility of missing the targets by 2030.

Among the indicators for which the results are positive and with a clear prospect of a favorable evolution until 2030, we can list SDG 11(60)—recycling rate of municipal waste, SDG 12(30)—average CO₂ emissions per km of new cars, SDG 12(41)—rate of use of circular materials, and SDG 15(20)—area of protected land areas. From this point of view, all EU member states register a positive evolution.

On the other hand, the research results indicate negative developments for most European countries in terms of SDG 11(31)—settlement area per capita, SDG 14(60)—marine waters affected by eutrophication, and SDG 15(41)—soil sealing index.

The results obtained highlight indicators for which the projected trends are divergent between European countries, with some countries showing a greater concern for environmental protection issues and a favorable trend in the main indicators included in the SDGs. Countries for which unfavorable trends are expected would need to adopt best practice models from better-performing countries in order to improve their own performance. Among the indicators with diverging forecasts at European level, we can mention SDG 6(40)—nitrate in groundwater, SDG 12(21)—raw material consumption, SDG 12(51)—generation of waste, SDG 13(10)—greenhouse gas emissions, and SDG 13(21)—net greenhouse gas emissions of the land use, land use change and forestry (LULUCF) sector.

Limitations inherent in the use of this predictive analysis approach must be taken into account when interpreting the results of this study. The accuracy of the results could be influenced by the absence of consistent data, potential inaccuracies in modelling and the unpredictable influence of political, economic or social variables that may have an impact on future trends. In addition, because there is a substantial time lag between the publication of data and the implementation of corrective policies that address specific disparities, there will be a delayed reflection of policy impacts in the available data.

Author Contributions: Conceptualization, D.F., G.H.I., L.M.C., L.V., T.M.C. and R.-Ş.B.; Methodology, D.F., G.H.I. and L.M.C.; Writing—original draft, D.F. and G.H.I.; Writing—review and editing, D.F., G.H.I., L.M.C., L.V., T.M.C. and R.-Ş.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are contained within the article and mentioned in the references.

Conflicts of Interest: The authors declare no conflict of interest.

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