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The Road to 2030: Evaluating Europe's Progress on Sustainable Ecosystem Protection and Restoration

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Abstract: The 2030 Agenda for Sustainable Development emphasizes the interconnectedness of its economic, social, and environmental dimensions, recognizing their essential role in promoting human well-being. This study provides an in-depth analysis of EU Member States' progress towards Sustainable Development Goal (SDG) 15—Life on Land—as outlined in the 2030 Agenda. Using official data from Eurostat, this study applies the AAA (Holt–Winters) exponential smoothing algorithm to analyze trends in key indicators from 2011 to 2021 and project these trends to 2030. The results reveal notable progress in the first years since the adoption of the 2030 Agenda but also highlights drought and soil erosion as escalating risks, particularly in Mediterranean regions and areas of intensive agriculture (Spain, Cyprus, Greece). Water quality emerges as a critical concern, and, alongside the ongoing rise in soil sealing, presents an added threat to ecological stability, agricultural productivity, and overall well-being.

Keywords: sustainable development; 2030 agenda; SDG 15; life on land; terrestrial ecosystems

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1. Introduction

The sustainable development of society, the economy, and the environment is one of the most pressing and complex challenges of our time, focused on securing essential resources without compromising the needs of future generations. Sustainable development is a holistic concept, pursuing a balanced and sustainable approach that integrates three essential dimensions: economic growth, environmental protection, and social well-being. It involves meeting present needs while preserving the ability of future generations to meet theirs, thus promoting a resilient and equitable society. This concept is a central goal of the 2030 Agenda for Sustainable Development, a global initiative adopted by United Nations (UN) member states in 2015 [1].

In addition to promoting the sustainability of human actions and the economy, protecting the environment and terrestrial ecosystems through sustainable practices is a key objective for contemporary society. In all regions and nations, governments, organizations and various entities have a responsibility to implement solutions that protect life on Earth and promote long-term well-being.

Achieving sustainability, especially from the perspective of terrestrial ecosystems, means maintaining a balance with nature in all human activities. This goal is increasingly important as we face growing challenges such as climate change, pollution, soil degradation, desertification, deforestation, resource overexploitation, urban sprawl, and habitat fragmentation. These negative phenomena collectively threaten biodiversity, environmental health, and the fundamental capacity of ecosystems to sustain life.

In this context, restoring and promoting the sustainable use of terrestrial ecosystems is undoubtedly the central pillar of the whole society, an aspect supported, as stated above, by the 2030 Agenda, the 17 specific Sustainable Development Goals, especially SDG 15 ("Earth Life") through the sustainability of all economic, social, physical, and ecological aspects of the Earth so as to mitigate climate change but also pollution. It is undoubtedly recognized that restoring the health of degraded land is essential for human development, as land is a vital life support system that directly or indirectly influences the achievement of the Sustainable Development Goals and beyond. These considerations are all the more important given that more than 33% of the global land surface is degraded, which is increasingly affecting the livelihoods of billions of people across the planet [2].

Reviewing the available literature, it is noticeable that there is a knowledge gap in terms of forecasting the potential evolution of the specific SDG 15 indicators until 2030, even though 8 years have already passed since the adoption of the 2030 Agenda with the definition of its specific targets. Therefore, we aimed to fill this knowledge gap through the results presented in this research in a synthetic way, bringing together all the key indicators tracked in the EU member countries. In order to understand the current status of SDG 15's target achievements, as well as the challenges related to the achievement of these targets, we individually analyzed the representative literature published to date.

This research study aims to critically assess the progress made by EU Member States in achieving the goals of SDG 15—Life on land—as committed to in the 2030 Agenda. Our analysis is based on an in-depth examination of relevant data published by the Statistical Service of the European Union (Eurostat) on the key indicators established to monitor the pursuit of SDG 15 by the 28 EU Member States.

The increased interest in the protection of ecosystems is justified, considering that it was necessary to urge all governments and specific bodies to develop strategies and measures to stabilize climate disruptions, to reduce carbon emissions, greenhouse gases, and all aspects that cause degradation of the environment, ecosystems, and quality of life [3,4].

We can recognize a large number of projects, actions, policies, and strategies in this regard, such as the actions undertaken by the United Nations (e.g., the restoration of more than 68 million hectares of degraded land and coastlines). However, identifying priority areas, developing appropriate technologies, adopting best practices and policies, and assessing the environmental, climate, and social benefits and costs are still significant global and regional challenges that require investments but also different measures depending on the level of local and regional degradation of terrestrial ecosystems [3,5].

In the same spirit of common global policies and efforts, we also identify the post-2020 Kunming-Montreal Global Biodiversity Framework (GBF) which was developed as a consequence of the Convention on Biological Diversity (CBD) on the conservation of biodiversity and ecosystem services for the next three decades. It set ambitious targets for ecosystem restoration, particularly in light of SDG 15, which aims to restore ecosystems. The Kunming-Montreal Global Biodiversity Framework (GBF) was adopted during the fifteenth meeting of the Conference of the Parties (COP 15) with key targets for both 2030 and 2050 [6].

Equally important are strategies such as reforestation, revegetation, revegetation, invasive species removal, wetland rewetting, direct seeding, and soil remediation, applied in different regions of the world. However, there are notable differences globally, particularly in the timing of the implementation of these measures, depending on the degree of degradation of each area. The correct identification of priority areas for ecosystem restoration is also essential, as this provides a solid basis for the use of innovative technologies, particularly focused on combating soil erosion and desertification. In addition, ecosystem stability and resilience are key factors used to assess the effectiveness and success of these restoration efforts [3].

Not to be neglected is also the fact that ecosystem restoration actions and targets focus on positive outcomes for biodiversity, even if there is still considerable disagreement and confusion about the different types of terrestrial ecosystem restoration actions. It is therefore essential to distinguish different types of restoration, monitoring, and reporting. This action will be essential for effective ecological restoration, as current commitments are insufficient to meet the GBF (Kunming-Montreal Global Biodiversity Framework) targets to increase the area and integrity of the natural ecosystem [4,7].

Based on these considerations related to the necessity of protecting the terrestrial ecosystem, this paper aims to identify how Europe, namely, the Member States of the European Union, is prepared to achieve the objectives of the 2030 Agenda for Sustainable Development on protecting, restoring, and promoting the sustainable use of terrestrial ecosystems.

Therefore, this paper will identify in the first part the current state of knowledge from the perspective of SDG 15 ("Life on land") that tracks the evolution of terrestrial ecosystems and the evolution of specific indicators. The second part of this paper will focus on a critical assessment of the progress made by EU Member States in achieving SDG 15 targets, in line with the commitments made through the adoption of the 2030 Agenda.

This research is grounded in the analysis of relevant data published by the Statistical Office of the European Union (Eurostat) on the key indicators established for monitoring the achievement of SDG 15 by the 27 EU Member States [8]. The time series was deliberately chosen to cover an extended period, at least five years before the implementation of the Paris Agreement in 2015. This longer time span is designed to allow a detailed analysis of the selected indicators, taking into account significant events that could have had a considerable impact on their evolution.

Furthermore, this paper focuses in particular on the successful experiences of European Union Member States, which have demonstrated exceptional performance in protecting terrestrial ecosystems, and, from this perspective, a successful model can be created for lagging countries and beyond. Issues such as current policies and strategies, climate change impacts, ecosystem restoration initiatives, innovative technologies for ecosystem management, etc., are just some of the benchmarks for analyzing the current State-of-the-Art methods in protecting terrestrial ecosystems.

2. Materials and Methods

The forecasting model used in this study was based on data reported by the EU countries on the evolution of the nine specific indicators of SDG 15, covering the full period from 2011 to 2021. In the case of indicators for which data were reported at a 3-year interval, the interpolation method was used to calculate the missing values from the selected reference years. The time series was deliberately selected to cover an extended period, including five years prior to the implementation of the Paris Agreement in 2015. This wider time scope was intended to allow a comprehensive examination of the selected indicators, incorporating significant events that could have had substantial implications for their evolution.

The existing literature shows a clear separation between two main categories of forecasting models, which were grouped into traditional and contemporary models. Traditional models (ETS, ARMA, ARIMA, SARIMA) have been fundamental in time series forecasting. Contemporary models (LSTM, FBProphet, DNN), on the other hand, have emerged with technological advances, with the intention of surpassing the predictive capabilities of traditional models, but each of them has distinct drawbacks that limit their effectiveness in certain contexts [9–13].

Reviewing the advantages and disadvantages of models appropriate to the context of this research, we opted for a traditional approach, specifically the AAA (Holt–Winters) exponential smoothing algorithm. ETS algorithms, including Holt–Winters, are widely recognized for their adaptability and simplicity, making them indispensable tools in time series forecasting. This adaptability is particularly advantageous in situations where data exhibit varying levels of seasonality or where the seasonal pattern undergoes dynamic changes over time. The flexibility of ETS models arises from their three core components:

error, trend, and seasonality. These components enable ETS to effectively capture and model complex patterns within data, offering a nuanced representation of intricate temporal structures [9,11,14,15].

The robustness of traditional time series forecasting models, such as ETS, is rooted in their well-established statistical foundations and proven reliability across a variety of applications. These models are built on sound mathematical principles that have been rigorously studied and tested over decades, ensuring their capacity to deliver consistent and accurate forecasts across a wide range of conditions. A critical aspect of their robustness lies in their interpretability; the selected model provides clear insights into how different components—such as trend, seasonality, and noise—contribute to the overall behavior of the time series.

Moreover, traditional models' reliance on prior values and straightforward parameter estimation processes allows them to perform reliably even with relatively small datasets or limited computational resources. This property makes them a practical choice in many real-world scenarios where data may be noisy, incomplete, or challenging to model using more complex methods [16,17]. In general, the robustness of traditional models is derived from their simplicity, interpretability, and strong theoretical foundations, all of which contribute to their enduring relevance in time series forecasting.

In the AAA (Holt–Winters) iteration of the ETS exponential smoothing algorithm, weights are systematically assigned to time-varying variables based on a geometric progression sequence of the form $\{1, (1-\alpha), (1-\alpha)^2, (1-\alpha)^3, \ldots, \infty\}$ [18–20]. This exponential weighting mechanism ensures that more recent observations have a greater influence on the forecast, while older data points contribute less significantly. The forecast value generated by this method extends the historical data forward to the target date, adhering strictly to the time sequence and structure as dictated by the core equations of the Holt–Winters multiplicative approach. This approach not only models the seasonality as a proportion of the level but also adjusts dynamically for both trends and seasonal variations, thereby enhancing the precision of the forecasts.

The use of multiplicative components in this iteration allows the model to accommodate variations in seasonality that change in proportion to the level of the series, making it particularly effective for datasets where the amplitude of seasonal fluctuations evolves over time. Consequently, the Holt–Winters method within the ETS framework improves both the accuracy and reliability of forecasts, particularly in contexts where capturing complex seasonal patterns is crucial [16]. This methodological rigor and adaptability underscore the efficacy of the AAA iteration in producing robust forecasts across diverse time series applications:

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

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

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

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

where

L_t = level;

B_t = trend;

S_t = seasonal component;

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

α, β, γ = smoothing parameters;

s = length of seasonality;

m = frequency of the seasonality.

3. Empirical Results

Based on the research methodology described previously, this section presents the findings related to each of the nine key indicators for SDG 15. The results of the forecasting models are summarized in separate tables. Each table includes the reported values of the indicators for the years 2011, 2015, and 2021 in the first three columns, to facilitate the tracking of relevant data at key periods. The subsequent columns present projected estimates for 2025 and 2030, as well as the rate of change in 2025 and 2030 compared to the reference year 2015. The final column illustrates the estimated trend for the analyzed indicator, facilitating the visualization of the projected trend up to 2030, based on the data available to date.

The first SDG 15 key indicator included in this research provides essential data on the extent and health of forest ecosystems and wooded areas, which are vital for biodiversity, climate regulation, and ecosystem services (Table 1). Forests and wooded lands play a significant role in sequestering carbon dioxide, thus mitigating climate change, while also supporting diverse flora and fauna, preserving water cycles, and providing resources and livelihoods for many communities. Tracking this indicator enables policymakers to assess progress towards maintaining and enhancing forest cover, address deforestation and land degradation, and implement effective conservation strategies, thereby contributing to the broader goals of environmental sustainability, climate action, and the preservation of natural resources. As can be seen from the data summarized in Table 1, the expected trend up to 2030 for almost all EU countries is positive, i.e., an increase in the area occupied by forests and other wooded land is expected.

Table 1. SDG 15–10—Share of forest and other wooded land (% of total land area).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	40.2	41.9	43.5	44.7	46.4	1.07	1.11	UP
Belgium	22.2	23.1	25.1	26.3	27.8	1.14	1.20	UP
Bulgaria	n.a.	44.7	50.8	54.6	60.1	1.22	1.34	UP
Czech Republic	37.3	37.7	38.2	38.6	39.0	1.02	1.04	UP
Denmark	13.5	15.6	17.3	18.7	20.6	1.20	1.32	UP
Germany	31.0	32.2	33.1	33.7	34.7	1.05	1.08	UP
Estonia	56.9	58.2	59.3	60.3	61.6	1.04	1.06	UP
Ireland	19.9	22.4	21.0	21.3	22.1	0.95	0.99	UP
Greece	39.7	44.5	50.5	54.8	60.5	1.23	1.36	UP
Spain	35.6	39.2	43.9	47.2	51.6	1.20	1.32	UP
France	30.4	31.0	33.4	34.7	36.3	1.12	1.17	UP
Croatia	n.a.	50.6	65.4	75.3	89.0	1.49	1.76	UP
Italy	34.5	35.6	37.9	39.5	41.5	1.11	1.17	UP
Cyprus	n.a.	39.7	48.5	55.2	63.9	1.39	1.61	UP
Latvia	54.4	56.4	57.5	58.7	60.3	1.04	1.07	UP
Lithuania	37.3	38.3	40.6	42.0	43.8	1.10	1.14	UP
Luxembourg	34.1	36.3	36.5	36.9	37.4	1.02	1.03	UP
Hungary	22.9	25.2	27.6	29.3	31.8	1.16	1.26	UP
Malta	n.a.	11.5	9.0	7.2	4.8	0.62	0.42	DOWN
Netherlands	7.4	8.0	11.6	13.4	15.6	1.67	1.94	UP
Austria	45.1	46.7	47.3	47.7	48.5	1.02	1.04	UP
Poland	34.1	36.1	37.7	39.1	40.9	1.08	1.13	UP
Portugal	40.2	46.6	54.5	60.2	67.6	1.29	1.45	UP
Romania	n.a.	34.1	37.0	39.0	41.6	1.14	1.22	UP
Slovenia	62.0	63.4	63.0	63.0	63.1	0.99	1.00	UP
Slovakia	46.6	48.7	49.8	51.0	52.6	1.05	1.08	UP
Finland	69.9	71.3	70.8	71.0	71.5	1.00	1.00	UP
Sweden	65.9	66.5	67.9	68.8	70.0	1.03	1.05	UP

Source: Eurostat, own calculations. # forecasted values. n.a. not reported data.

A notable exception to the general upward trend is Malta, where research indicates a downward trend if immediate action is not taken to halt the downward trend. Although

Malta has limited woodland cover—only 5% of the island's landmass—significant portions of arable land are being repurposed for property development and national infrastructure projects. A positive example was expressed in 2020, when Malta signed, with 100 other countries at COP 26 in Glasgow, a commitment against deforestation, trying to limit the negative effects of deforestation [21].

The second key indicator of SDG 15 is vital for assessing the effectiveness of conservation efforts and ensuring the protection of ecosystems and biodiversity. By measuring the extent of land designated for conservation, this indicator reflects the commitment to preserving natural habitats, safeguarding endangered species, and maintaining ecosystem services that are critical for environmental health and human well-being. Protected areas serve as refuges for wildlife, help mitigate climate change by maintaining carbon sinks, and offer opportunities for sustainable tourism and recreation. Monitoring this indicator allows for the evaluation of progress towards global conservation targets, informs policy decisions, and supports the sustainable management of terrestrial resources.

As was the case for the previous indicator, the evolution of the terrestrial protected areas is on an upward trend until 2030 in all EU countries, without exception (Table 2).

Table 2. SDG 15–20—Surface of the terrestrial protected areas (% of terrestrial protected area).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27		25.1	26.0	26.8	27.6	1.07	1.10	UP
Belgium	13.0	13.0	14.7	14.7	15.4	1.13	1.19	UP
Bulgaria	34.0	34.0	41.0	41.4	44.7	1.22	1.32	UP
Czech Republic	14.0	14.0	21.9	22.1	25.7	1.58	1.83	UP
Denmark	9.0	8.0	14.9	15.5	18.8	1.94	2.35	UP
Germany	15.0	15.0	37.4	37.8	47.9	2.52	3.20	UP
Estonia	18.0	18.0	20.9	20.9	22.2	1.16	1.23	UP
Ireland	13.0	13.0	13.9	13.9	14.3	1.07	1.10	UP
Greece	27.0	27.0	34.9	35.1	38.7	1.30	1.43	UP
Spain	27.0	27.0	28.0	28.0	28.5	1.04	1.05	UP
France	13.0	13.0	28.0	28.1	34.9	2.16	2.68	UP
Croatia	n.a.	37.0	38.1	38.5	39.3	1.04	1.06	UP
Italy	19.0	19.0	21.4	21.5	22.5	1.13	1.19	UP
Cyprus	28.0	29.0	37.7	39.3	44.2	1.35	1.52	UP
Latvia	12.0	12.0	18.2	18.3	21.2	1.53	1.76	UP
Lithuania	12.0	12.0	17.1	17.5	19.9	1.45	1.66	UP
Luxembourg	18.0	27.0	55.8	62.9	81.6	2.33	3.02	UP
Hungary	21.0	21.0	22.2	22.2	22.8	1.06	1.08	UP
Malta	13.0	13.0	29.0	29.3	36.6	2.26	2.82	UP
Netherlands	15.0	15.0	26.5	26.8	32.0	1.79	2.14	UP
Austria	15.0	15.0	29.2	29.4	35.8	1.96	2.39	UP
Poland	20.0	20.0	39.6	40.0	48.9	2.00	2.45	UP
Portugal	21.0	21.0	22.4	22.4	23.1	1.07	1.10	UP
Romania	23.0	23.0	23.4	23.5	23.7	1.02	1.03	UP
Slovenia	36.0	38.0	40.5	41.1	42.9	1.08	1.13	UP
Slovakia	29.0	29.0	37.4	39.4	44.0	1.36	1.52	UP
Finland	13.0	13.0	13.3	13.3	13.4	1.02	1.03	UP
Sweden	13.0	12.0	15.0	13.9	14.5	1.16	1.21	UP

Source: Eurostat, own calculations. # forecasted values. n.a. not reported data.

The third SDG 15 indicator included in this research is essential for understanding and managing the effects of drought on ecological systems. This indicator measures the extent and severity of drought-induced damage to ecosystems, which can lead to significant biodiversity loss, reduced water availability, and compromised ecosystem services such as soil fertility and carbon sequestration (Table 3).

Table 3. SDG 15–42—Drought impact area on ecosystems (%).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	3.1	3.2	1.4	10.3	13.7	3.22	4.28	UP
Belgium	13.5	0.1	0.0	61.2	88.7	100.0	100.0	UP
Bulgaria	0.2	0.1	0.2	4.6	6.5	45.63	64.49	UP
Czech Republic	0.1	7.8	0.1	7.8	9.4	1.01	1.21	UP
Denmark	0.1	0.1	0.1	15.0	21.6	100.0	100.0	UP
Germany	4.0	2.7	0.1	21.4	29.5	7.94	10.93	UP
Estonia	0.0	0.4	1.5	11.0	15.3	27.38	38.21	UP
Ireland	0.0	0.1	0.2	2.6	3.8	25.94	38.03	UP
Greece	0.1	0.1	3.9	3.5	5.4	35.59	54.22	UP
Spain	1.8	1.7	0.5	0.0	0.0	0.0	0.0	NONE
France	13.0	0.2	0.2	30.5	44.0	100.0	100.0	UP
Croatia	9.5	1.1	0.9	5.7	5.2	5.14	4.71	UP
Italy	1.9	0.9	2.6	5.7	7.6	6.31	8.44	UP
Cyprus	0.4	0.1	6.2	6.0	4.1	59.60	40.98	UP
Latvia	0.0	0.4	2.6	8.3	11.6	20.73	29.01	UP
Lithuania	0.0	2.0	0.4	16.6	22.9	8.32	11.44	UP
Luxembourg	42.7	0.1	0.1	85.5	100.0	100.0	100.0	UP
Hungary	0.5	3.6	1.3	0.4	0.0	0.11	0.0	DOWN
Malta	0.0	0.1	0.8	0.6	0.0	5.57	0.0	NONE
Netherlands	0.0	0.1	0.1	22.4	31.2	100.0	100.0	UP
Austria	2.1	7.2	1.1	4.4	8.7	0.60	1.21	UP
Poland	0.0	21.3	1.5	8.9	17.0	0.42	0.80	UP
Portugal	2.8	4.3	0.1	4.6	3.3	1.07	0.78	NONE
Romania	0.2	2.1	0.1	0.8	2.2	0.38	1.05	UP
Slovenia	6.0	0.6	2.0	22.4	30.9	37.30	51.54	UP
Slovakia	0.0	9.8	0.2	3.7	2.2	0.38	0.23	DOWN
Finland	1.6	0.4	4.0	6.4	8.7	16.10	21.65	UP
Sweden	0.4	1.9	3.8	7.8	10.7	4.09	5.64	UP

Source: Eurostat, own calculations. # forecasted values.

By tracking these impacts, stakeholders can better assess the resilience of ecosystems to climate variability, implement targeted mitigation and adaptation strategies, and enhance preparedness for future drought events. These actions are crucial for sustaining natural resources, supporting agricultural productivity, and ensuring the overall health and functionality of ecosystems that underpin human well-being and economic stability.

The fourth relevant indicator is essential for assessing the vulnerability of land to soil degradation processes, which can have profound implications for agricultural productivity, ecosystem health, and water quality. Soil erosion by water can lead to the loss of fertile topsoil, reduced crop yields, and the sedimentation of water bodies, affecting aquatic habitats and water management (Table 4).

By identifying areas at risk of severe erosion, this indicator helps inform land management and conservation strategies to prevent soil loss, protect soil health, and maintain ecosystem stability. Effective monitoring and mitigation efforts guided by this indicator are essential to promote sustainable land use practices, enhance food security, and ensure long-term environmental resilience.

In terms of the aggregated EU-wide indicators, Eurostat publishes data on two such indicators specific to SDG 15. The Common Bird Index monitors trends in bird populations, which serves as a key indicator of overall ecosystem health and biodiversity, while the Grassland Butterfly Index assesses the health of grassland ecosystems and their biodiversity (Table 5).

Table 4. SDG 15–50—Area at risk of severe soil erosion by water (%).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	5.31	5.32	5.30	5.29	5.29	1.00	0.99	DOWN
Belgium	0.42	0.41	0.44	0.44	0.44	1.06	1.08	UP
Bulgaria	3.31	3.07	3.91	4.09	4.21	1.27	1.37	UP
Czech Republic	1.31	1.33	1.28	1.27	1.26	0.96	0.95	DOWN
Denmark	0.00	0.01	0.00	0.00	0.00	n.a.	n.a.	NONE
Germany	1.31	1.36	1.20	1.16	1.14	0.88	0.84	DOWN
Estonia	0.00	0.00	0.00	0.00	0.00	n.a.	n.a.	NONE
Ireland	0.67	0.68	0.65	0.65	0.65	0.97	0.95	DOWN
Greece	9.57	9.44	9.89	9.98	10.04	1.05	1.06	UP
Spain	8.99	8.88	9.28	9.36	9.42	1.04	1.06	UP
France	3.29	3.37	3.09	3.03	2.99	0.92	0.89	DOWN
Croatia	5.45	6.75	2.20	1.22	0.57	0.33	0.08	DOWN
Italy	24.88	24.66	25.41	25.57	25.68	1.03	1.04	DOWN
Cyprus	6.43	6.17	7.10	7.30	7.43	1.15	1.21	UP
Latvia	0.01	0.01	0.01	0.01	0.01	1.00	1.00	NONE
Lithuania	0.02	0.02	0.02	0.02	0.02	1.00	1.00	NONE
Luxembourg	2.63	2.65	2.60	2.59	2.58	0.98	0.98	DOWN
Hungary	2.52	2.56	2.42	2.39	2.37	0.95	0.93	DOWN
Malta	10.93	12.24	7.64	6.66	6.00	0.62	0.49	DOWN
Netherlands	0.01	0.01	0.01	0.01	0.01	1.00	1.00	NONE
Austria	15.51	15.55	15.41	15.38	15.36	0.99	0.99	DOWN
Poland	1.13	1.10	1.22	1.24	1.26	1.11	1.14	UP
Portugal	4.14	4.38	3.54	3.36	3.24	0.81	0.74	DOWN
Romania	7.34	7.48	7.01	6.91	6.84	0.94	0.92	DOWN
Slovenia	18.99	18.97	19.04	19.05	19.06	1.00	1.01	UP
Slovakia	4.58	4.68	4.33	4.25	4.20	0.93	0.90	DOWN
Finland	0.01	0.01	0.01	0.01	0.01	1.00	1.00	NONE
Sweden	0.68	0.68	0.68	0.68	0.68	1.00	1.00	NONE

Source: Eurostat, own calculations. # forecasted values. n.a. not reported data.

Table 5. SDG 15–60 and SDG 15–61—EU aggregates (index, 2000 = 100).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
Common bird index	93.10	91.16	88.40	86.63	84.40	0.95	0.93	DOWN
Grassland butterfly index	114.02	106.73	68.27	37.10	5.71	0.35	0.05	DOWN

Source: Eurostat, own calculations. # forecasted values.

Birds are sensitive to changes in their environment, and shifts in their populations can reflect broader ecological changes, such as habitat loss, climate change, and pollution. Tracking the Common Bird Index helps in assessing the impact of these environmental pressures on avian species and ecosystems, guiding conservation efforts and informing policies aimed at preserving biodiversity. By understanding and responding to changes in bird populations, stakeholders can better address the underlying environmental issues, promote sustainable land use, and support the conservation of various species and habitats.

In a relatively similar way, butterflies are sensitive to changes in their habitat. This indicator provides insights into the quality of grassland habitats, which are essential for maintaining plant–pollinator interactions and overall ecosystem stability. Changes in the Grassland Butterfly Index can signal shifts in habitat quality due to factors such as land use changes, climate change, or pollution, thereby informing conservation strategies and management practices.

The next key indicator included in this research is the level of biochemical oxygen demand in rivers. This indicator measures the mean annual five-day biochemical oxygen demand (BOD5) in rivers, weighted by the number of measuring stations. Elevated levels signal higher pollution, which can deplete oxygen in the water, leading to adverse effects on aquatic life, such as fish die-offs and disruptions in food chains. Constant monitoring of the biochemical oxygen level allows for the evaluation of wastewater treatment effectiveness, the identification of pollution sources, and the implementation of necessary measures to safeguard and restore river ecosystems. Ensuring low biochemical oxygen levels is crucial for maintaining water quality, supporting biodiversity, and protecting water resources for both human and ecological needs (Table 6).

Table 6. SDG 6–30—Biochemical oxygen demand in rivers (mg O_2 per liter).

Countries †	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	2.58	3.13	2.77	2.79	2.79	0.89	0.89	DOWN
Belgium	2.53	2.91	2.27	2.29	2.16	0.79	0.74	DOWN
Bulgaria	2.87	2.74	3.03	2.76	2.76	1.01	1.01	UP
Czech Republic	2.69	2.75	2.60	2.54	2.49	0.92	0.91	DOWN
Estonia	1.74	1.73	1.64	1.62	1.61	0.94	0.93	DOWN
Ireland	1.49	1.16	1.11	0.85	0.63	0.73	0.54	DOWN
Spain	1.59	4.56	3.59	4.20	4.81	0.92	1.05	UP
Croatia	1.83	1.92	1.89	1.76	1.69	0.92	0.88	DOWN
Italy	1.96	1.84	1.60	1.28	0.98	0.69	0.53	DOWN
Cyprus	3.94	2.00	2.41	0.78	0.89	0.39	0.45	DOWN
Latvia	1.47	1.18	2.19	2.52	2.95	2.13	2.50	UP
Lithuania	2.23	2.05	1.98	1.90	1.76	0.93	0.86	DOWN
Austria	2.33	1.88	1.13	0.76	0.20	0.40	0.11	DOWN
Poland	3.87	2.76	2.66	2.45	2.18	0.89	0.79	DOWN
Romania	4.35	3.97	3.48	2.81	2.21	0.71	0.56	DOWN
Slovenia	0.97	0.84	0.78	0.69	0.61	0.83	0.73	DOWN
Slovakia	2.58	2.75	1.89	1.61	1.21	0.58	0.44	DOWN
Finland	2.60	1.91	1.57	1.07	1.00	0.56	0.53	DOWN
Sweden	5.34	5.98	6.11	6.40	6.71	1.07	1.12	UP

Source: Eurostat, own calculations. # forecasted values. † Countries not listed in the table have not reported data.

The eighth SDG15 indicator included in this research quantifies the concentration of phosphate in the dissolved phase of water. Phosphates, when present in high concentrations, can lead to nutrient pollution, which stimulates the excessive growth of algae and aquatic plants, a process known as eutrophication. This process can result in harmful algal blooms, decreased oxygen levels, and the degradation of aquatic habitats, which negatively affects fish and other aquatic organisms. The effective management of phosphate concentrations is crucial for maintaining balanced and healthy river ecosystems, supporting biodiversity, and ensuring clean water resources for both ecological and human uses (Table 7).

The last specific indicator for SDG 15 considered for this research is critical for understanding the impact of urbanization and land use changes on soil health and ecosystem functionality. Soil sealing refers to the process by which natural land surfaces are covered by impermeable materials such as asphalt and concrete, which prevents water infiltration, disrupts natural drainage patterns, and reduces soil fertility. High levels of soil sealing can lead to increased surface runoff, a higher risk of flooding, the loss of agricultural land, and diminished habitats for plants and animals. Unfortunately, as can be seen from the data presented in Table 8, the forecasted values for this indicator for all EU Member States are on an upward trend until 2030, which represents a warning signal to all stakeholders (Table 8).

In order to achieve a broader perspective on the potential evolution of the values of the specific indicators for SDG 15 by 2030, as well as on the potential of the EU Member States to achieve the targets assumed, Table 9 summarizes the main expected trends until 2030 for each specific indicator included in the analysis. The table does not include the evolution of the indicators 15–60 and 15–61, as these are aggregated at the level of the whole European Union (Table 9).

Table 7. SDG 6–50—Phosphate in rivers (mg PO_4 per liter).

Countries †	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	0.057	0.063	0.074	0.088	0.097	1.39	1.54	UP
Belgium	0.217	0.188	0.174	0.187	0.187	1.00	0.99	NONE
Bulgaria	0.133	0.094	0.189	0.290	0.405	3.09	4.30	UP
Czech Republic	0.109	0.126	0.085	0.072	0.057	0.57	0.46	DOWN
Denmark	0.051	0.051	0.053	0.053	0.055	1.05	1.08	UP
Estonia	0.029	0.023	0.022	0.023	0.024	1.02	1.03	UP
Ireland	0.034	0.023	0.022	0.019	0.014	0.81	0.63	DOWN
Spain	0.052	0.159	0.199	0.267	0.328	1.68	2.06	UP
Croatia	0.032	0.022	0.018	0.013	0.006	0.59	0.28	DOWN
Italy	0.037	0.071	0.055	0.057	0.061	0.80	0.86	DOWN
Latvia	0.021	0.013	0.017	0.016	0.014	1.22	1.10	UP
Lithuania	0.053	0.080	0.205	0.264	0.349	3.30	4.36	UP
Romania	0.090	0.105	0.087	0.096	0.097	0.92	0.93	DOWN
Slovenia	0.032	0.045	0.029	0.030	0.030	0.67	0.66	DOWN
Slovakia	0.081	0.092	0.050	0.036	0.017	0.39	0.19	DOWN
Finland	0.016	0.016	0.015	0.013	0.010	0.84	0.62	DOWN
Sweden	0.012	0.008	0.007	0.004	0.002	0.52	0.22	DOWN

Source: Eurostat, own calculations. # forecasted values. † Countries not listed in the table have not reported data.

Table 8. SDG 11–32—Soil sealing index (index, 2006 = 100).

Countries	2011	2015	2021	2025 #	2030 #	2025/2015	2030/2015	Trend
EU-27	102.2	102.6	104.3	105.4	106.7	1.03	1.04	UP
Belgium	101.6	101.9	103.3	104.1	105.2	1.02	1.03	UP
Bulgaria	102.0	102.3	103.7	104.6	105.8	1.02	1.03	UP
Czech Republic	102.0	102.3	103.8	104.7	105.9	1.02	1.04	UP
Denmark	101.6	101.8	103.2	104.1	105.2	1.02	1.03	UP
Germany	101.8	102.1	103.4	104.2	105.3	1.02	1.03	UP
Estonia	101.8	102.2	103.2	104.0	105.0	1.02	1.03	UP
Ireland	101.8	102.1	104.1	105.9	107.6	1.04	1.05	UP
Greece	101.3	101.6	102.8	103.6	104.6	1.02	1.03	UP
Spain	103.5	104.2	106.4	108.0	110.0	1.04	1.06	UP
France	102.3	102.8	104.5	105.6	107.1	1.03	1.04	UP
Croatia	101.5	101.9	103.7	105.0	106.5	1.03	1.04	UP
Italy	101.6	101.9	103.0	103.8	104.7	1.02	1.03	UP
Cyprus	106.3	107.9	113.7	117.5	122.2	1.09	1.13	UP
Latvia	101.1	101.5	102.4	103.0	103.9	1.01	1.02	UP
Lithuania	101.1	101.3	102.0	102.6	103.2	1.01	1.02	UP
Luxembourg	103.0	103.6	105.6	107.0	108.8	1.03	1.05	UP
Hungary	102.3	102.7	104.3	105.4	106.8	1.03	1.04	UP
Malta	100.4	100.4	104.4	106.0	107.7	1.06	1.07	UP
Netherlands	102.3	102.6	104.6	105.7	107.3	1.03	1.05	UP
Austria	101.7	101.9	103.3	104.2	105.3	1.02	1.03	UP
Poland	103.9	104.6	106.9	108.2	110.0	1.03	1.05	UP
Portugal	102.1	102.6	104.1	105.2	106.6	1.03	1.04	UP
Romania	102.7	103.2	105.0	106.2	107.7	1.03	1.04	UP
Slovenia	101.8	102.1	103.5	104.7	106.0	1.03	1.04	UP
Slovakia	103.5	104.1	106.2	107.6	109.5	1.03	1.05	UP
Finland	101.5	101.7	102.9	103.7	104.6	1.02	1.03	UP
Sweden	101.2	101.4	102.6	103.5	104.5	1.02	1.03	UP

Source: Eurostat, own calculations. # forecasted values.

Table 9. Estimated trends for key SDG 15 indicators towards 2030.

Countries	SDG 15–10	SDG 15–20	SDG 15–42	SDG 15–50	SDG 6–30	SDG 6–50	SDG 11–32
EU-27	↗	↗	↗	↘	↘	↗	↗
Belgium	↗	↗	↗	↗	↘	→	→
Bulgaria	↗	↗	↗	↗	↗	↗	↗
Czech Republic	↗	↗	↗	↘	↘	↘	↗
Denmark	↗	↗	↗	→	n.a.	↗	↗
Germany	↗	↗	↗	↘	n.a.	n.a.	↗
Estonia	↗	↗	↗	→	↘	↗	↗
Ireland	↗	↗	↗	↘	↘	↘	↗
Greece	↗	↗	↗	↗	n.a.	n.a.	↗
Spain	↗	↗	→	↗	↗	↗	↗
France	↗	↗	↗	↘	n.a.	n.a.	↗
Croatia	↗	↗	↗	↘	↘	↘	↗
Italy	↗	↗	↗	↘	↘	↗	↗
Cyprus	↗	↗	↗	↗	↘	n.a.	↗
Latvia	↗	↗	↗	→	↗	↗	↗
Lithuania	↗	↗	↗	→	↘	↘	↗
Luxembourg	↗	↗	↗	↘	n.a.	n.a.	↗
Hungary	↗	↗	↘	↘	n.a.	n.a.	↗
Malta	↘	↗	→	↘	n.a.	n.a.	→
Netherlands	↗	↗	↗	→	n.a.	n.a.	↗
Austria	↗	↗	↗	↘	↘	n.a.	↗
Poland	↗	↗	↗	↗	↘	n.a.	↗
Portugal	↗	↗	→	↘	↘	n.a.	↗
Romania	↗	↗	↗	↘	↘	↘	↗
Slovenia	↗	↗	↗	↗	↘	↘	↗
Slovakia	↗	↗	↘	↘	↘	↘	↗
Finland	↗	↗	↗	→	↘	↘	↗
Sweden	↗	↗	↗	→	↗	↘	↗

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

4. Discussions

The in-depth analysis of the research results indicates that European countries are actively working to protect and conserve terrestrial ecosystems, dedicating various human and financial resources toward achieving the goals outlined in the 2030 Agenda. However, the findings also reveal the existence of concerning trends that could significantly hinder efforts to restore and promote these ecosystems. While commendable progress is being made in aligning with the 2030 Agenda goals, this research uncovers specific challenges and negative trends that could obstruct progress across Member States. This dual perspective underscores the need to not only recognize the achievements but also to address emerging challenges, ensuring a comprehensive and resilient approach to sustainable development in European countries.

4.1. Share of Forest Area (sdg_15_10)

The SDG 15–10 indicator, "Share of forest and other wooded land," is critical because it reflects the overall health and extent of terrestrial ecosystems, which are essential for biodiversity, carbon sequestration, and the livelihoods of millions. Forests play a pivotal role in mitigating climate change by absorbing carbon dioxide, supporting diverse species, and preserving soil and water quality. This indicator helps monitor the conservation and sustainable management of these ecosystems, making it fundamental in assessing countries' efforts to protect natural resources, which are crucial to achieving the broader sustainability and environmental goals outlined in the 2030 Agenda.

Forested areas, covering 31% of the world's land, are vital to long-term sustainability, but their extent has significantly decreased over time [22]. The conversion of forests to agricultural land has often brought negative consequences, including global warming and environmental imbalances [23–25]. Europe, with about 40% of its land covered by forests, is one of the most forested regions in the world [26]. Despite relatively extensive management practices, European forests face threats such as pollution, habitat loss, and growing urbanization. Additionally, the increasing demand for biomass puts further pressure on these critical ecosystems, making sustainable management even more essential [27,28].

As the analysis shows, most EU countries, with the exception of Malta, are expected to increase their forest and other wooded land area by 2030, with varying rates of increase. Thus, an example of good practice is Portugal, which is estimated to increase, by 45%, the area allocated to forests and other wooded land by 2030 [29]. Portugal has been increasing its forested areas due to a combination of reforestation efforts, sustainable land management practices, and policies aimed at enhancing biodiversity and combating climate change. The country's focus on forest expansion is driven by the recognition of the critical role that forests play in carbon sequestration, soil protection, and water regulation. Additionally, Portugal has been working to restore degraded lands and convert abandoned agricultural areas into forests, contributing to an increase in forest cover. Efforts to manage and prevent forest fires, which have historically been a significant challenge in Portugal, also support this increase by promoting healthier, more resilient forest ecosystems. These results are in line with research published by Nunes et al. [30] and Reboredo and Pais [31].

4.2. Surface of the Terrestrial Protected Areas (sdg_15_20)

The extent of terrestrial protected areas (SDGs 15–20) reflects the extent of land designated for biodiversity conservation and the protection of natural habitats. These areas are vital for protecting ecosystems, species, and genetic diversity from human pressures and environmental degradation. By providing a refuge for endangered species and supporting ecological processes, protected areas play a crucial role in monitoring environmental health and promoting recovery.

The expansion of protected areas is a global priority, contributing directly to restoring biodiversity, mitigating the impacts of climate change and combating habitat loss. The high rates of climate change but also the frequent changes in land use through the spatial adaptive management of natural resources become key points in the actions undertaken by many of the world's governments to achieve sustainable development and biodiversity goals and beyond. From this perspective, unfortunately, by 2070, most countries are expected to fail to conserve their climate at current levels by 90% [32,33].

Despite these efforts, biodiversity loss remains a significant social and ecological emergency. Many existing protected areas are too small or poorly connected to provide adequate protection for endangered species, highlighting the need for more strategic siting and better management [34,35]. In the European Union, 26% of land was protected in 2021, and the EU Biodiversity Strategy aims to increase this amount to 30% by 2030 [36]. However, if the current rate of increase of 1.7 percentage points per decade persists, this target may not be met. To ensure success, EU Member States need to accelerate their efforts to designate and manage new protected areas, focusing on effective environmental management rather than just expanding land cover [37,38].

As indicated by current research results, at the current rate of growth, achieving the 30% target by 2030 appears very challenging. Nonetheless, EU Member States are actively preparing pledges to designate additional protected areas by the target date, which will provide critical information on the feasibility of reaching the 2030 Agenda goal and identify any significant gaps in the current conservation strategy. We can underline the efforts of Germany and Poland, for which growth rates well above the EU average are estimated, proving that remarkable results can be achieved even for more ambitious targets. In fact, the results of our research correspond to the research published by Schumacher et al. [39], who state that the goals for more wilderness areas in Germany are ambitious but achievable. Brackhane et al. [40], Cazzolla Gatti et al. [41], and Zbierska [42] also reached similar conclusions.

4.3. Drought Impact Area on Ecosystems (sdg_15_42)

The impact of drought on ecosystems (SDG 15–42) is a crucial indicator, especially in the context of the recent climate emergencies in Europe. Droughts severely affect biodiversity, water resources, and soil quality, disrupting ecosystem services essential for human well-being and environmental stability. Monitoring these impacts helps to understand ecological disturbances, guide effective adaptation strategies, and promote sustainable land and water management.

The impact of drought on socio-economic activities but also on life on the planet is certainly becoming more and more evident, an aspect that calls for government policy measures with immediate applicability that prioritize the elimination/reduction in greenhouse gases and the adaptation of ecosystems to climate change. Drought impacts may increase further if national adaptation strategies are not effectively implemented [43,44]. Also, droughts and extreme heat cause rapid declines in vegetation with large impacts on biodiversity, aridity, and vegetation cover. These aspects emphasize the large role that vegetation dynamics play in the drought phenomenon and highlight the phenomenon that soil water depletion, due to future warming-induced vegetation increases, could cause more frequent and severe droughts [45,46].

Within the EU, monitoring the impacts of meteorological droughts underpins policy measures aimed primarily at eliminating greenhouse gases as well as adapting ecosystems to climate change. In recent years, Europe has experienced the hottest summers on record, with more than 630,000 km^2 of land affected by drought. It is also evident that drought impacts may increase further if global mitigation and EU's national adaptation strategies are not effectively implemented [47].

According to the results obtained through this research, if the trend of past years will remain unchanged, the general situation is expected to worsen in EU countries, with an increase in the areas affected by drought estimated for most Member States. The few countries for which no clear trend can be defined, or for which slight decreases are expected, are most likely to be affected by droughts in the future, given the accelerating climate change. We emphasize the importance of adopting firm and immediate measures at the level of all EU countries in order to reduce the rate of increase in the areas affected by drought as well as for the mitigation of side effects. The results of our research are in line with numerous published studies on this topic, which emphasize the level of urgency and the need for immediate measures to reduce and even stop this phenomenon.

4.4. Area at Risk of Severe Soil Erosion by Water (sdg_15_50)

SDG indicator 15–50, 'Area at risk of severe soil erosion by water', is critical because it highlights a major threat to environmental and agricultural sustainability. Water erosion reduces soil fertility, decreases agricultural productivity, and increases sedimentation in water bodies, affecting food security, biodiversity, and ecosystem health. Despite extensive research, quantifying large-scale erosion remains a challenge as millions of hectares worldwide are at risk from erosion, making the identification of spatial patterns an urgent issue [48].

Changes in future soil erosion rates are determined by local or regional climatic conditions, land use patterns, the socio-economic development of regions, farmer/investor choices, and, last but not least, by agri-environmental policies. In this sense, for the EU, the Common Agricultural Policy (CAP, 2023–2027) has an important role in supporting farmers and improving agricultural productivity, ensuring a stable supply of food at affordable prices, protecting the right of EU farmers to earn a reasonable living, contributing to combating climate change, and the sustainable management of natural resources [49].

The results of our research indicate positive estimates for most European countries, which are expected to reduce the areas potentially affected by severe soil erosion by water, suggesting that public authorities are making efforts in this direction, especially in the current context of the negative effects induced by climate change. The results obtained for a number of European countries (Belgium, Greece, Spain, Greece, Cyprus, Poland, Spain) indicate a potential increase in the areas affected by floods by 2030, if no preventive measures are taken. Belgium faces increasing erosion due to climate change, intensive agriculture, and land use changes, particularly in its hilly Wallonia region. Mediterranean countries like Spain, Cyprus, and Greece suffer more severe issues due to their climate patterns of dry periods followed by intense rainfall, coupled with mountainous terrain. These nations struggle with deforestation, overgrazing, and the abandonment of traditional practices like terracing. Spain's southern and eastern regions, Cyprus's mountains, and Greece's islands and coasts are especially vulnerable. Poland, while generally less affected, contends with erosion in its southern hills and along river valleys, mainly due to intensive agriculture. Across all five countries, human activities exacerbate natural erosion processes, with climate change expected to intensify these challenges. The mix of climatic, topographic, and anthropogenic factors creates a complex erosion landscape, requiring tailored approaches to soil conservation and sustainable land management.

Currently, unsustainable management practices and climate change are threatening soil quality to an increasing extent, which is why rapid changes in land use and socio-economic activities associated with climate change are imposing high pressures on the soils of the region. In this regard, we identify biodiversity management as one of the necessary solutions to mitigate risks and reduce damage, coupled with increasing soil organic matter by covering with crop varieties with higher residue and root production as well as reducing dependence on fossil fuels by avoiding the use of synthetic chemicals [50,51].

4.5. Common Bird Index by Type of Species (sdg_15_60) and Grassland Butterfly Index–EU Aggregate (sdg_15_61)

Birds are highly sensitive to environmental pressures, making their populations a reliable indicator of changes in their natural habitats. Unfortunately, in the EU, the index of 168 common bird species declined by 12% between 1990 and 2021. Given this trend, it is unlikely that the decline in common bird populations will be reversed by 2030 [37,52,53].

Similarly, butterflies play a crucial role in ecosystems, providing services such as pollination and serving as indicators of environmental health due to their sensitivity to change. Their declining numbers signal wider environmental problems, as they are key indicators for other insects essential for ecosystem functioning. Their decline also threatens the pollination of wildflowers and some crops, endangering habitats and biodiversity. [54,55].

EU-wide data show that, between 1991 and 2020, populations of 15 grassland butterfly species declined sharply by 29.5%. Population restoration, therefore, includes improving pollinator diversity and reversing the decline of pollinator populations by 2030 at the latest, which requires Member States to implement appropriate restoration measures in different ecosystems [56,57].

The results of our research indicate a clear and worrying worsening of the current situation by 2030. These indices track population trends of widespread bird and butterfly species, serving as sensitive barometers of habitat quality and overall environmental conditions. Birds and butterflies respond quickly to changes in land use, climate, and pollution levels, making them excellent proxies for broader biodiversity trends.

The decline in values for the Common Bird Index and Grassland Butterfly Index projected to 2030 can be attributed to a combination of factors, including habitat loss, climate change, and agricultural intensification. Habitat degradation, driven by urban expansion and agricultural practices, results in the fragmentation of critical areas necessary for the survival and reproduction of these species. Climate change exacerbates this issue by altering the availability of resources and shifting habitats, making it increasingly difficult for species to adapt or migrate. Additionally, the intensification of agriculture, including the use of pesticides and fertilizers, negatively impacts the quality of grassland ecosystems, further threatening the populations of both birds and butterflies. These results are correlated and confirmed by research published by Zingg et al. [58] and Herrando et al. [59], suggesting that the abandonment of traditional land use practices could be considered one of the main causes of the decline of species in open habitats.

4.6. Biochemical Oxygen Demand in Rivers (sdg_06_30)

Environmental pollution is a growing threat to sustainable development and quality of life, with biological oxygen demand becoming a key challenge in assessing water quality to ensure environmental and human health. Tackling this environmental crisis and monitoring biochemical oxygen demand is an ongoing challenge, although some innovative technologies can mitigate the harmful effects of pollution on ecosystems [60–62].

Biochemical oxygen demand in rivers (SDG 6–30) measures the oxygen required by microorganisms to break down organic matter in water. High levels indicate organic pollution, leading to oxygen depletion, which can harm aquatic life. Monitoring BOD5 levels helps assess organic pollution and river health, guiding better management strategies. Clean rivers have a BOD5 of less than 1 mg/L, while moderately polluted rivers range from 2 to 8 mg/L [60].

The results of our research indicate Latvia as one of the European countries most affected by the increase in BOD5. This increase can be attributed to several interrelated factors. Firstly, agricultural runoff contributes significantly to higher BOD5 levels due to the influx of organic matter, such as fertilizers and animal waste, into water bodies [63]. Additionally, industrial activities and inadequate wastewater treatment infrastructure further exacerbate this issue, as untreated or poorly treated effluents release high amounts of organic pollutants into rivers [64].

4.7. Phosphate in Rivers (sdg_06_50)

The phosphate in rivers indicator (SDG 6–50) is also very important for assessing the health of aquatic ecosystems because phosphates are key nutrients that can influence the growth of algae and aquatic plants. While phosphates are essential in small amounts, excessive concentrations, often resulting from agricultural runoff, sewage discharge, and industrial effluents, can lead to eutrophication. This process triggers excessive algal blooms, which can deplete oxygen levels in the water as the algae decompose, causing hypoxia and creating "dead zones" where aquatic life cannot survive [65–67].

As the results suggest, for a significant part of the countries that have reported values of this indicator, a downward trend in the values is forecast until 2030, which is good news in the context of meeting the 2030 Agenda targets. However, based on the data recorded so far and without significant interventions, unfavorable developments are estimated for a few countries, the most affected being Bulgaria, Spain, and Lithuania, for which values are forecast to be more than 300% higher than the EU average in 2030.

The key factors potentially influencing these potentially negative developments are primarily related to agricultural practices, urbanization, and inadequate wastewater treatment. In these countries, agricultural runoff is a major source of phosphate pollution, as fertilizers rich in phosphates are commonly used to enhance crop yields. When it rains, these phosphates are washed into rivers, increasing their concentrations [68,69]. Urbanization also plays a significant role, with expanding cities leading to greater sewage discharge, often containing phosphates from household detergents and industrial processes. In cases where wastewater treatment facilities are outdated or insufficient, untreated or poorly treated sewage can enter waterways, further elevating phosphate levels [70].

4.8. Soil Sealing Index (sdg_11_32)

The increase in soil surfaces sealed with impermeable materials generated by urban development, mainly buildings, to a very large extent leads to an imbalance in the ecosystem, especially when areas change their use. Therefore, in order to respond to the targets set by the 2030 Agenda on the terrestrial ecosystem, it is necessary to create different remote sensing techniques to monitor this process and to create soil sealing maps at local and national levels so that the degree of soil sealing can be permanently monitored [71,72].

Soil sealing reduces carbon and nutrient stocks compared to green spaces but can increase soil carbon and nitrate content, particularly in areas with an industrial past. Anthropogenic additions may lead to higher urban soil carbon stocks, contributing significantly to urban soil carbon budgets. More research is needed to understand these processes in both sealed and unsealed soils and their effects on ecosystem services [73,74]. In the EU, soil sealing often affects fertile land, harms biodiversity, increases flooding and water scarcity risks, and contributes to global warming, with urban areas expanding by 78% since the 1950s [75].

The results of our research indicate a unanimous worsening of this indicator in European countries by 2030. There are numerous published studies pointing to this phenomenon, both at micro and macro level, the negative effects of which are widely debated in the literature [50,76]. The results clearly suggest that the targets set by the 2030 Agenda for this indicator will not be met by any of the EU countries.

The implications of this research for SDG 15 highlight both progress and current challenges in protecting, restoring, and promoting the sustainable use of terrestrial ecosystems in the European Union. The findings show that European countries are increasingly allocating resources to achieve the objectives of SDG 15, as evidenced by notable efforts to expand forest cover, designate protected areas, and improve water quality indicators. However, several negative trends, such as increased soil erosion, the lingering effects of drought and urban-induced soil sealing, highlight critical obstacles that could hamper the region's overall success. Thus, while substantial efforts are being made, addressing these negative trajectories is essential for the effective realization of the ambitions of SDG 15.

To increase the effectiveness of EU policies in achieving SDG 15, stronger enforcement mechanisms at the Member State level are essential. While the EU sets ambitious environmental targets, differing levels of commitment and capacity among countries often lead to inconsistent implementation. Strengthened monitoring and accountability measures at the Member State level could ensure that ecosystem protection and restoration objectives are consistently met. Increased funding and investment in green infrastructure is also essential as many initiatives, such as reforestation and waterway rehabilitation, require sustained financial support. Expanding financial resources, possibly through public–private partnerships and increased support from the European Investment Bank, would strengthen restoration efforts in the long term.

Moreover, fostering closer collaboration between government agencies, local communities, and research institutions can accelerate the adoption of sustainable practices and technologies, creating a more comprehensive, community-centered approach to ecosystem conservation and improving the overall resilience of these initiatives.

This research recognizes several limitations, primarily related to the variability of available data and differing rates of progress between EU Member States. Relying on indicators reported from sources such as Eurostat may not capture all the nuances of regional environmental degradation or the socio-economic factors influencing each country's performance. In addition, the challenges of establishing causality and comprehensively assessing long-term impacts suggest the need for further investigation and data integration at both local and regional scales.

Given these limitations, future research should prioritize improving data quality and developing more refined indicators that reflect the complex dynamics affecting ecosystem health. Other areas for exploration may include assessing the effectiveness of current policy interventions, investigating the socio-economic dimensions of ecosystem degradation, and advancing technological solutions to mitigate soil erosion and restore biodiversity. Expanding research on adaptive land management practices tailored to the specific climatic and geographical conditions in Europe could provide valuable information for targeted actions and strengthen the resilience of ecosystems to climate change.

5. Conclusions

Achieving the goals of SDG 15, as committed to by EU countries through the 2030 Agenda, is not only important for environmental sustainability but also for achieving broader socio-economic goals, including poverty reduction, food security, and global health, making it a cornerstone of global sustainable development.

The analysis of this research results reveals both progress and challenges in the conservation and restoration of terrestrial ecosystems in European countries. While substantial efforts are being made to align with the 2030 Agenda, particularly in terms of increasing forests and other wooded land, significant obstacles remain that could hinder these efforts. Countries such as Portugal have made notable progress in afforestation and sustainable land management, setting an example for other Member States. However, progress is uneven, with some regions facing greater challenges in achieving their conservation goals.

In addition, research highlights growing environmental threats that could undermine these conservation efforts. Drought and soil erosion are emerging as significant risks, particularly in Mediterranean regions and areas with intensive agriculture. These problems, exacerbated by climate change, threaten biodiversity, agricultural productivity, and the overall health of ecosystems. If current trends continue, areas affected by drought and soil erosion are expected to increase, posing a serious challenge to sustainable development.

Water quality is also emerging as a critical concern, with indicators such as phosphate levels and biochemical oxygen demand (BOD5) showing worrying trends in countries such as Latvia, Bulgaria, Spain, and Lithuania. These problems are largely caused by agricultural run-off, urbanization, and inadequate wastewater treatment, leading to pollution that threatens aquatic ecosystems and human health. Tackling these problems will require stronger water management and pollution control measures across the EU.

While European countries are making commendable progress in some areas of ecosystem conservation, significant challenges remain. The increasing threats posed by drought, soil erosion, and water pollution need to be addressed through targeted and coordinated efforts to ensure that the 2030 Agenda goals can be met. A comprehensive and resilient approach to sustainable development is needed to overcome these challenges and preserve the health of Europe's ecosystems.

Our research contributes to filling knowledge gaps regarding the potential for achieving the 2030 Agenda goals for protecting, restoring, and promoting the sustainable use of terrestrial ecosystems. The findings can inform decisions and actions by relevant parties and will hopefully inspire further research and improve understanding, thereby promoting the protection of terrestrial ecosystems.

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