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Supporting Sustainable Development Goals through Regulation and Maintenance Ecosystem Services

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Abstract: Sustainable development goals (SDGs) have a huge impact on global policies. Contextually, the concept of ecosystem services (ESs) naturally relies on the importance of integrating human activities into a framework in which ecosystems play a fundamental role in supporting upcoming societies. Introducing ESs in the process of SDG evaluation can be useful to facilitate their achievement through national and local planning policies. Nevertheless, this aspect is still poorly addressed. In the present study, an in-depth analysis has been conducted, to associate regulation and maintenance ecosystem services (ReMESs) with the SDGs set by the 2030 Agenda. Based on the available scientific literature, ReMESs have been linked to the SDGs and SDG targets. Specific attention has been paid to deepening linkages with the SDG targets that explicitly address the introduction of ecosystem and biodiversity values into national and local planning. Finally, SDG evaluation has been further investigated, linking the SDG targets to the statistical measures proposed by the Inter-agency and Expert Group on SDGs (UN-IAEG-SDGs). This last step focused on the Italian context, according to the indicators provided by the National Institute of Statistics. The results show that ReMESs are linked to 8 out of 17 SDGs (47%). Connections decrease when considering the SDG targets (20%) and the national statistical measures (18%). It also emerges that some targets, although being connected to ReMESs, do not have the right indicators to be quantified. Ecosystem services prove to be a valid element through which modern sustainable development goals can be accomplished. This study, which highlights several gaps to be filled, wants to offer valuable help in evaluating SDGs and their implementation through ReMESs.

Keywords: regulating ecosystem services; sustainable development goals; IAEG-SDG indicators

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1. Introduction

The potential for anthropic activities to shape the environment has grown over time, to the point that today the term landscape encompasses a plurality of natural and anthropic processes interacting with each other [1]. Nevertheless, the interactions between these two elements can also lead to several threats for both, such as biodiversity loss and increased exposure to natural extreme events [2,3]. Hence, the complex interactive nature between humans and ecosystems results in both positive and negative feedback mechanisms. The latter, whose causes lie in the continuous exploitation of natural resources, pose threats for future societies [4].

An example of the controversial side of the relationship between humans and the environment is represented by the metropolitan city [5,6]. In this context, high-density urban settlements define living conditions and processes characterized by a high unsustainability [7]. Problems such as natural extreme events, poverty gaps, and the poor availability of nutritious and healthy foods are a daily challenge [5]. Nevertheless, urban centers and human activities have constantly grown in recent decades [8,9]. The need to fight climate change, increasing poverty, and social inequalities focused global attention on the search for a solution that encompasses both the causes and the effects of this imbalance between man

and nature [10–14]. Here, the concept of ecosystem health, intended as "the ability to meet the reasonable demands of human society" and "the health and integrity of maintaining and updating the ecological environment and the ecosystem, as well as the health and social health of urban dwellers" [15], began to assert itself as a fundamental element to set up sustainable development strategies [16–18]. This broad, new awareness saw its consequence in one of the schemes that is trying to give a boost to the application of the new paradigms of sustainable development: the 2030 Agenda [19].

This document, which is currently influencing global policies, precisely aims to define an action plan for the three Ps (people, planet, and prosperity), articulating them through 17 sustainable development goals (SDGs) and 169 targets.

Since their first conceptualization and adoption, the SDGs and their targets have been addressed as elements whose operability was fundamental to achieving sustainable development, also considering the potentialities of their combined actions [20–22].

However, as suggested by its name, the objectives set by the agenda must be achieved no later than the year 2030.

The UN produces an annual report to monitor the global achievement of SDGs [23]. In this context, the progress in implementing and achieving SDGs in national policies is assessed.

Specifically, each state is associated with a performance score, corresponding to the distance that must be filled (in percentage points) to have an optimal SDG performance.

Overall, the country showing the highest percentage is Finland (86.7%), followed by Sweden (86%) and Denmark (85.7%).

In these countries, SDG achievement is realized by formulating a national sustainable development strategy with a high level of involvement among governments, scientific institutions, and citizens.

Despite the high attainment rates of Northern European countries, the SDGs are a long way from being achieved globally.

Globally, 15% of SDGs show a reversal of trend, 18% have been achieved or are on the right path, while 67% show limited or no progress at all [23]. One of the main problems is that national SDG strategies are not aligned with national agendas. According to the report provided by the UN itself [23], there is still much to be done, with little time to act.

Regardless of their articulation, SDGs always aim to protect ecosystems and the services they provide as a fundamental condition for human well-being.

Conceptualized in the 70s, ecosystem services (ESs) have been explored and analyzed for a long time, both in their capacity to enhance human lives and to support government actions of territorial dynamics [24]. It is well known that ESs help urban settlements enhance a lot of their characteristics such as climate resilience, healthy urban environments, sustainable cities and communities, and life support systems [25,26]. Furthermore, the connections with the SDGs make ESs an element whose operationalization could be a valid step to support sustainable policies. For example, [27] supported the linkages between ESs (classified according to the TEEB—The Economics of Ecosystems and Biodiversity) and the sustainable development goals through an online survey submitted to several ES experts worldwide. Similarly, Ref. [28] prioritized the SDGs of 66 different countries, subsequently linking the ESs that can fulfill the subtended objectives. Instead, Ref. [29] highlighted the importance of the ES concept to support the rapid recovery from the pandemic emergency set by the global spread of COVID-19. Other studies [30,31] deepened urban and peri-urban contexts through the ES concept and associated them with the corresponding SDG target.

Although formal linkages have been widely deepened, an approach capable of quantifying the relationships between ecosystem services and the objectives set by the 2030 Agenda is still missing.

To deepen this aspect, the proposed work analyzes the connections between regulating ecosystem services [32] and the 2030 Agenda SDGs.

The methodology starts from the definition of regulating ecosystem services provided by the Common International Classification of Ecosystem Services (CICES). Based on the description of each CICES group, this work deepens the connections with the SDGs

and SDG targets, based on the available scientific literature. This step has been useful in evaluating the quantity of SDGs connected, as well as the number of targets for which there was a correspondence. By doing this, it has been possible to evaluate ReMES potentialities that can be relied on to reach SDGs.

By connecting ReMESs and SDGs, specific attention has been paid to the SDG targets aimed at implementing environmental and biodiversity values into national and local planning.

Finally, considering the Italian context as a pilot area, it has been realized that there is a further connection with the indicators proposed by the National Institute of Statistics (ISTAT). The indicators resulted from an in-depth analysis of 139 statistical measures proposed by the Inter-agency and Expert Group on SDGs (UN-IAEG-SDGs) [33]. This last step allowed us to deepen the national level, contextually assuring the generalizability of the procedure, relying on an international panel of indicators.

This article is structured as follows: Section 1 (study area) delves into the conditions of the study area represented by the Italian context; Section 2 (materials and methods) explains the data considered and the connections between them; Section 3 (results) provides an overview of the results, while Section 4 (discussion) discusses the results obtained, focusing on the most important aspects which will be summarized later in Section 5 (conclusion), argued according to the potential limitations and future research outlets.

2. Materials and Methods

The study area represents the Italian context. Today, Italy is struggling to reach some of the fundamental 2030 Agenda SDGs. This condition has been confirmed by the last SDG report (2023), in which the country ranks 24th, with an SDG performance score equal to 78.8% [23]. Targets related to a reduction in poverty and the availability of drinking water show a net positive trend. Similarly, there is a moderate improvement for nine SDGs: health and well-being (3); gender equality (5); clean energy (7); work and economic growth (8); industry, innovation, and infrastructure (9); sustainable cities and communities (11); climate action (13); peace, justice, and strong institutions (16); and partnership for the goals (17). Finally, SDGs related to the protection of ecosystems (14 and 15), quality of education (4), quality education (10), reduced inequalities (2), and production cycles (12) show stagnation.

At the same time, Italy's path in the evaluation of SDGs is one of the most advanced.

The Ministry of the Environment and Energy Security is responsible for analyzing the conditions and trends of the SDGs in the country.

At the same time, to map and identify gaps in the actions related to SDGs, Italy relies on the Italian Alliance for Sustainable Development (ASVIS). This allows the involvement of nearly 300 organizations including universities, research, and civil society institutions and networks. Among these, ASVIS collaborated with the National Institute of Statistics (ISTAT) to calculate and publish the statistical measures related to the achievement of SDGs.

The last report (year of reference 2023) shows that, although several measures in the country are improving in the long term, indicators related to the 11th (sustainable cities and communities) and the 13th (climate action) SDGs are worsening. Italy is still involved in the process of continuous expansion of artificial areas, whose associated land take boom, dating back to the 1950s, shows no sign of stopping [34]. Hence, the improvement of urban settlements and land conditions, together with the fight against climate-change-related events, turns out to be an issue of fundamental importance that needs to be supported at the national scale to structure territorial government actions correctly [35–38].

Recently, the focus has been on reversing the processes that worsen local environmental conditions [39–43]. A virtuous example is the Umbria region, through which concepts such as the effective ecological network [44–46] are now finding full application [45,47]. Conjointly, soil4life [48] and other similar projects underway throughout the country [49,50] demonstrate the necessity to connect environmental issues, the ecosystem services aspect, and territorial government policies that cannot ignore these new paradigms of sustainable development.

To support the conceptual and practical connection between ReMESs and SDGs, this section will specify the elements that make up the structure of the methodology, together with the different connections that characterize it.

The first step starts by considering the ReMESs provided by the CICES (V 5.1). CICES has been conceptualized to directly assess the ecosystem outputs that directly affect human well-being, contextually distinguishing the social and economic system in which these services fit. Here, the "final services" naturally transform into goods or benefits, depending on their tangible (such as the monetary value of the timber) or less tangible nature (such as the recreational and cultural use of a woodland structure) [32]. This specific distinction is useful to address the highly heterogeneous nature of ecosystem services, partially overcoming the subjectivity of addressing ecosystem outputs [51].

Another major reason for choosing this system is the possibility of comparing different classifications. Indeed, the CICES has been intended also as a cross-reading tool with other ES classification systems [52].

Starting from the "Regulation and maintenance" section, the taxonomic-like classification of the CICES has been deepened at the group level [32]. The analyzed groups are as follows: (1) atmospheric composition and conditions (AC); (2) lifecycle maintenance, habitat, and gene pool protection (LM); (3) maintenance of physical, chemical, and abiotic conditions (MPCA); (4) regulation of baseline flows and extreme events (RBF); (5) regulation of soil quality (RSQ); (6) water conditions (WC); (7) mediation of waste, toxic substances, and other nuisances by non-living processes (MWNL); (8) mediation of waste or toxic substances of anthropogenic origin by living processes (MWL); and (9) pest and disease control (PDC).

First, a description of the considered ES groups has been provided. The descriptions have been deepened according to the literature provided by the CICES system [32].

Wherever absent, the scientific literature has been integrated to correctly describe the considered ES. This is the case of the "maintenance of physical, chemical, and abiotic conditions" and the "regulation of soil quality" ESs (Table 1).

Table 1. Regulation and maintenance ecosystem services (ReMESs) description. AC = atmospheric composition and conditions; LM = lifecycle maintenance, habitat, and gene pool protection; MPCA = maintenance of physical, chemical, and abiotic conditions; RBF = regulation of baseline flows and extreme events; RSQ = regulation of soil quality; WC = water conditions; MWNL = mediation of waste, toxic substances, and other nuisances by non-living processes; MWL = mediation of waste or toxic substances of anthropogenic origin by living processes; PDC = pest and disease control.

ReMES	ReMES Description (CICES V4.3)	References
AC	(i) Global climate regulation by reduction in greenhouse gas concentrations. (ii) Mediation of ambient atmospheric conditions (including micro- and mesoscale climates) by virtue of presence of plants.	[53–55]
LM	(i) The presence of ecological conditions (usually habitats) necessary for sustaining populations of species. (ii) The fertilization of crops by plants or animals. (iii) The dispersal of seeds and spores.	[56–58]
MPCA	Maintenance of physical, chemical, and abiotic conditions that affect people's well-being or comfort.	[59,60]
RBF	(i) The reduction in the loss of material by virtue of the stabilizing effects of the presence of plants and animals. (ii) The reduction in the speed of movement of solid material by virtue of the stabilizing effects of the presence of plants and animals. (iii) The regulation of water flows by virtue of the chemical and physical properties or characteristics of ecosystems. (iv) The reduction in the speed of movement of air by virtue of the presence of plants and animals. (v) The reduction in the incidence, intensity, or speed of spread of fire by virtue of the presence of plants and animals. (vi) Mediation of solid flows by natural abiotic structures. (vii) Mediation of liquid flows by natural abiotic structures. (viii) Mediation of gaseous flows by natural abiotic structures.	[61–64]

Table 1. *Cont.*

ReMES	ReMES Description (CICES V4.3)	References
RSQ	(i) Biological decomposition of minerals. (ii) Decomposition of biological materials and their incorporation in soils.	[65]
WC	(i) Maintenance of the chemical condition of freshwater by plant or animal species. (ii) Maintenance of the chemical conditions of saltwater by plant or animal species.	[66–68]
PDC	(i) The reduction by biological interactions in the incidence of species that prevent or reduce the output of food, material or energy from ecosystems, or their cultural importance, by consumption of biomass or competition. (ii) The reduction by biological interactions in the incidence of species that otherwise could prevent or reduce the output of food, material or energy from ecosystems, or their cultural importance, by hindering or damaging the ecological functioning of useful species.	[69,70]
MWNL	(i) The reduction in concentration of an organic or inorganic substance by mixing in a freshwater ecosystem. (ii) The reduction in concentration of an organic or inorganic substance by mixing in the atmosphere. (iii) Mediation of waste, toxic substances, and other nuisances by natural chemical and physical processes.	[71]
MWL	(i) Transformation of an organic or inorganic substance by a species of plant, animal, bacteria, fungi, or algae. (ii) The fixing and storage of an organic or inorganic substance by a species of plant, animal, bacteria, fungi, or algae.	[72]

Subsequently, the connections with the SDGs and SDG targets have been realized. Such analysis moves beyond the well-established relations between ESs and SDGs, formally highlighted by several studies [28,31].

Linkages have been realized upon the work proposed by [27]. By submitting a series of surveys to almost 560 researchers worldwide, the authors managed to highlight several links between ecosystem services and sustainable development goals. The methodology starts from this thesis but deepens the services of regulation and maintenance according to the CICES system. It also deepens the potential linkages with the SDG targets explicitly addressing the introduction of ecosystem and biodiversity values into national and local planning. These connections were not made in the work proposed by [27], which focused their attention on 44 out of 169 goals.

Several studies have already highlighted the contribution of ReMESs in supporting spatial planning and policies [73–79].

Based on the existing literature, it has been possible to link different aspects expressed in the targets more closely related to planning and policies. The studies upon which connections have been made are shown in Table 2. By considering the studies, connections have been established by answering the fundamental question "Can this ReMES help to achieve the considered SDG/SDG target?"

The last step is represented by the connections between ReMESs and the indicators provided by the Italian National Institute of Statistics (ISTAT). The ISTAT produces an annual report containing the statistical measures associated with each SDG target. This specific product moves from the 139 indicators proposed by the UN-IAEG-SDGs [33] to monitor the global progress of the 2030 Agenda. The ISTAT further populated the statistical measures that describe the SDG targets, reaching a total of 372 indicators.

Each SDG target has been connected to the corresponding ISTAT indicator (if present), following the dashboard provided by the national institute itself: https://public.tableau.com/app/profile/istat.istituto.nazionale.di.statistica/viz/SDGs_indicatori_giugno_2024/SDGs (accessed on 14 January 2024) and answering to the question "Does this indicator help to assess ReMES contribution to the considered SDG target?" The choice fell on those indicators capable of quantifying the aspects identified in Table 1.

Indicators addressed to highlight an effort by local economies to fight for specific phenomena, as well as indicators aimed at identifying social aspects (the nature of which goes beyond the scope of this study), have been left out (Figure 1).

Table 2. Sustainable development goal (SDG) target description and connected ReMESs. Together with these, the references upon which the linkages have been realized are reported.

SDG Target Description	Connected ReMESs	References
13.2—Integrate climate change measures into national policies, strategies and planning.	MPCA–AC-MWL	[73,74]
11.a—Support positive economic, social, and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.	AC–RBF-MWL	[74–76]
11.b—By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, and resilience to disasters, and develop and implement, in line with the Sendai Framework for disaster risk reduction 2015–2030, holistic disaster risk management at all levels.	AC–RBF-MWL	[77]
13.b—Promote mechanisms for raising capacity for effective climate-change-related planning and management in the least developed countries and small-island developing states, including focusing on women, youth, and local and marginalized communities.	AC–RBF-MWL	[73,78,79]
15.9—By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies, and accounts.	AC–LM–MPCA–RBF-RSQ–WC–MWNL-MWL	[73,78,79]

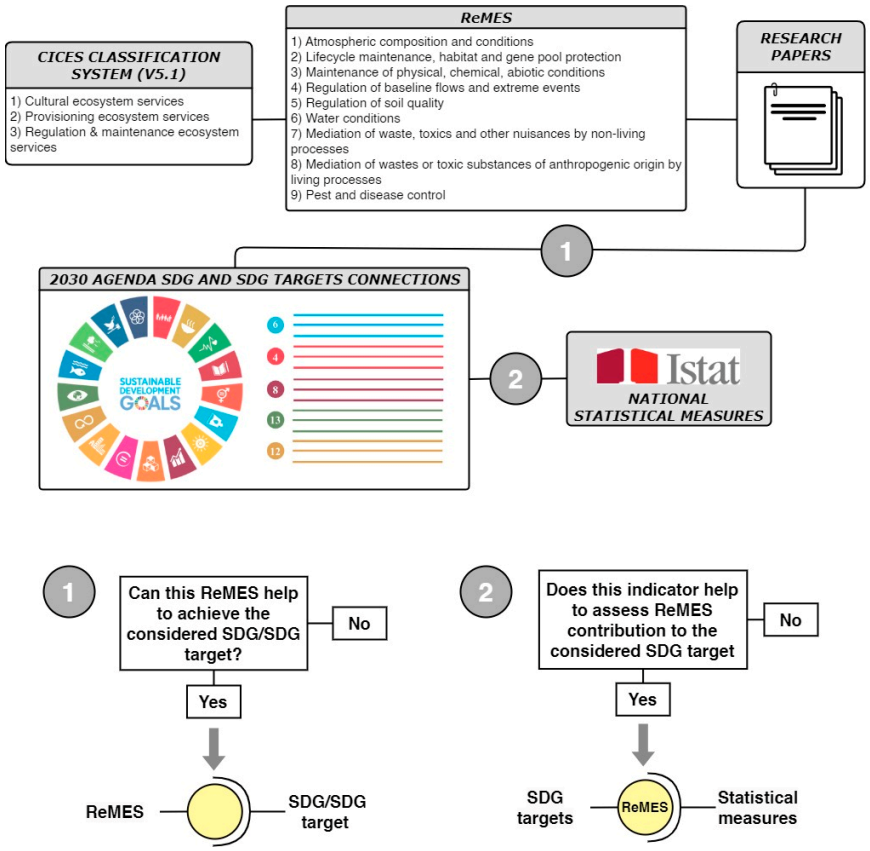

Figure 1. Methodology workflow. Once the regulation and maintenance ecosystem service (ReMES) groups had been defined, linkages were established with the SDGs and SDG targets, based on the relevant scientific literature. The last step consisted in linking the Italian national statistical measures, provided by the National Institute of Statistics (ISTAT).

3. Results

Considering all the connections, "mediation of wastes or toxic substances of anthropogenic origin by living processes" and "water conditions" are the most represented ESs when considering SDG linkages. This aspect is not maintained when considering linkages with the SDG targets, for which the highest correspondences are found with the "pest and disease control", the "mediation of wastes or toxic substances of anthropogenic origin by living processes", and the "atmospheric composition and conditions" ESs. Finally, based on the number of linkages with the ISTAT indicators, the most connected ESs appear to be "Mediation of wastes or toxic substances of anthropogenic origin by living processes", "Mediation of waste, toxics and other nuisances by non-living processes" and "Maintenance of physical, chemical, abiotic conditions".

At the same time, the least represented ESs are "lifecycle maintenance, habitat, and gene pool protection", "regulation of baseline flows and extreme events", and "regulation of soil quality" (Table 3).

Table 3. Connections between ReMESs, number of SDGs, and number of ISTAT indicators (statistical measures).

Ecosystem Services	N. of SDGs	N. of SDG Targets	N. of ISTAT Indicators
Atmospheric composition and conditions	5	10	28
Lifecycle maintenance, habitat, and gene pool protection	4	8	15
Maintenance of physical, chemical, and abiotic conditions	5	7	29
Mediation of waste, toxic substances, and other nuisances by non-living processes	6	9	34
Mediation of waste or toxic substances of anthropogenic origin by living processes	5	10	38
Regulation of baseline flows and extreme events	5	9	12
Pest and disease control	5	16	16
Regulation of soil quality	4	5	10
Water conditions	6	9	23

Regulation and maintenance ecosystem services show linkages with 8 out of 17 (47%) SDGs: no poverty (1), zero hunger (2), good health and well-being (3), clean water and sanitation (6), sustainable cities and communities (11), climate action (13), life below water (14), and life on land (15).

The percentage of connections decreases to 18% considering the associated SDG targets, for which 30 (out of 169) linkages have been found. Here, the 15.9 target, concerning biodiversity and ecosystem value integration into national and local planning, shows the highest correspondence, being connected to nine ReMESs. It is followed by the target concerning the implementation of sustainable agricultural practices (2.4) and cultural and natural heritage safeguarding (11.4), linked, respectively, to seven and six (out of nine) ReMESs.

The less connected targets concern agricultural productivity (2.3), malnutrition (2.2), and hunger (2.1); disease control (3.3 and 3.4); fighting for lowering exposure of poor people and economies to disasters (11.5); promotion of sustainable fishing practices (14.4); sustainable use of developing countries' natural resources (14.7); and promotion of sustainable development of forest ecosystems (15.2) (Figure 2).

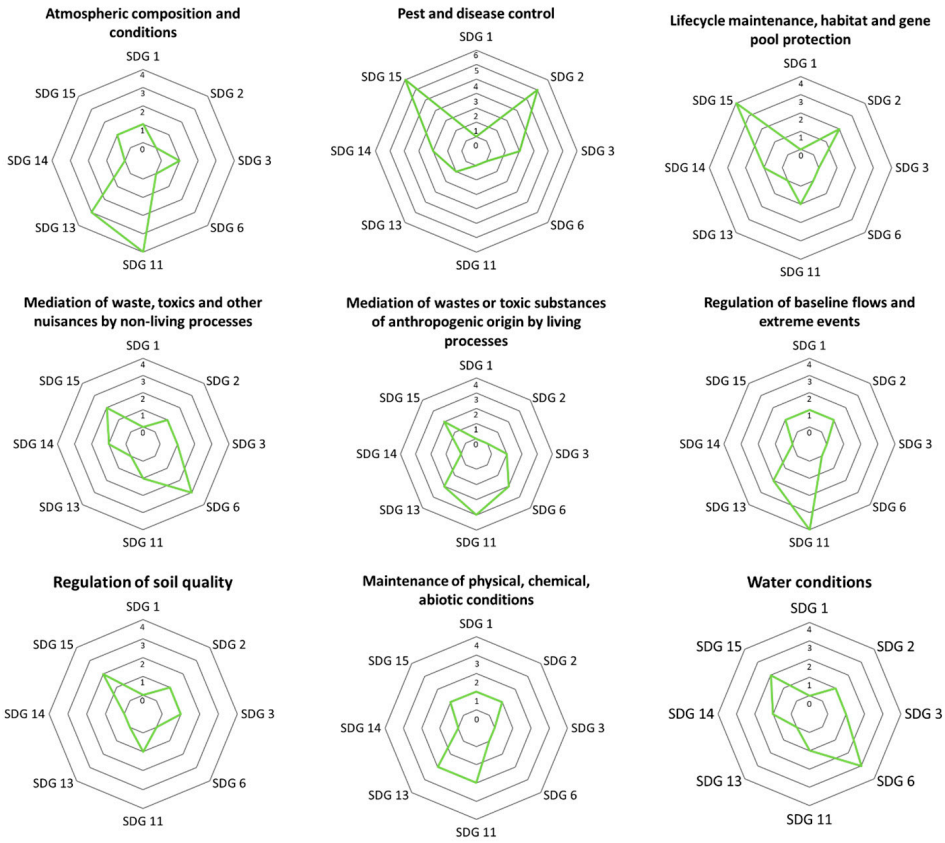

Figure 2. Radar charts showing the number of connections between ReMESs and the 2030 Agenda SDG targets.

Finally, from 372 ISTAT indicators, ReMESs have been linked to 75 statistical measures (20%).

When considering the SDG targets' representativeness through ISTAT indicators, the 6.3 target shows the highest number of connections (13 ISTAT indicators), followed by the 13.2 and the 13.1 targets, connected to 12 and 9 ISTAT indicators, respectively (Figures 3 and 4).

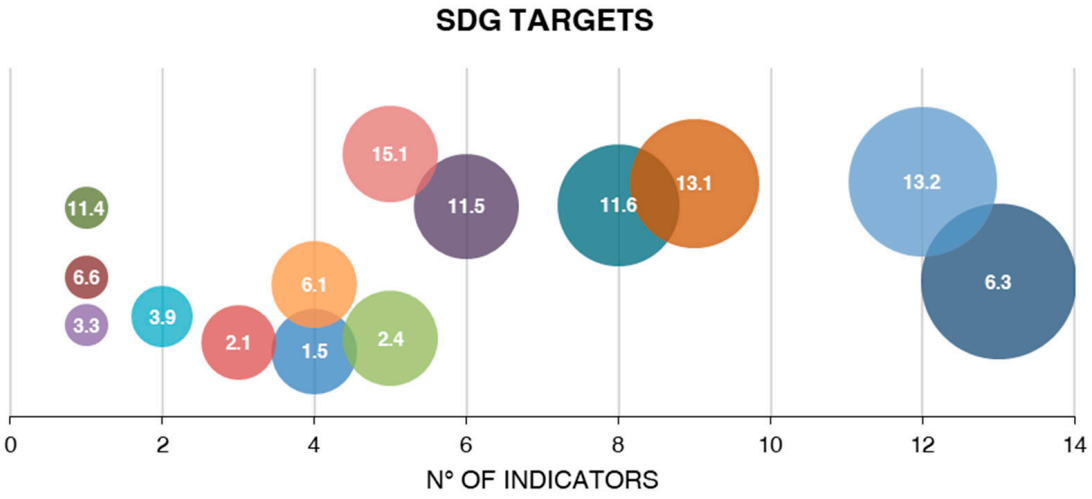

Figure 3. Bubble chart of the connections between the SDG targets and the ISTAT indicators.

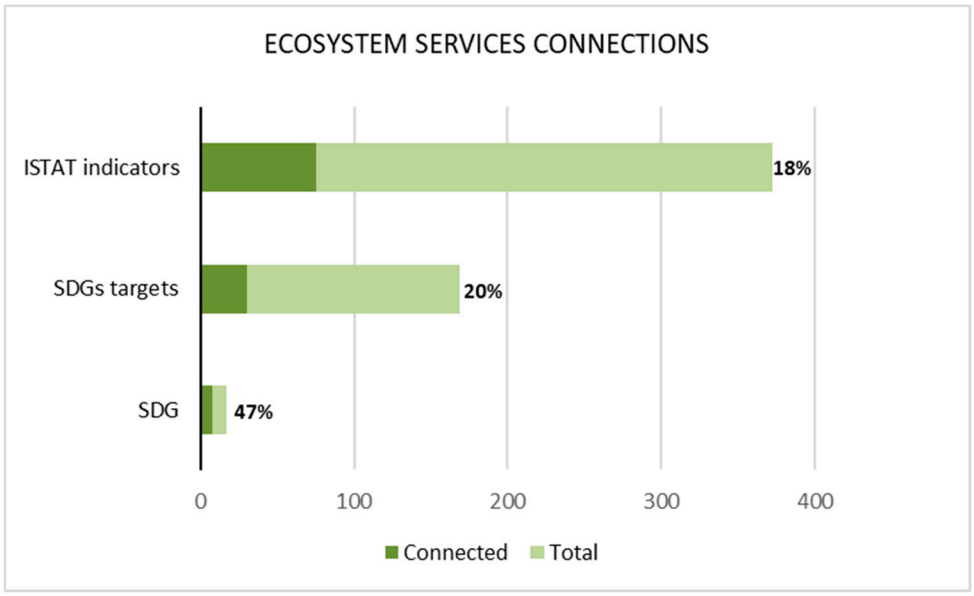

Figure 4. Percentages between total and connected (to the ReMESs) SDGs, SDG targets, and ISTAT indicators.

Among them, some statistical measures describe the achievement of multiple targets, such as the indicators 269 "Number of deaths and people missing due to landslides", 270 "Number of deaths and people missing due to floods/inundations", 271 "Number of injuries due to landslides", and 349 "Number of injured due to floods/inundations". These indicators, addressing natural disasters such as landslides and floods/inundation, have been used by the ISTAT to evaluate the achievement of the objectives of zero hunger (1), sustainable cities and communities (11), and climate action (13) simultaneously.

At the same time, thus being represented by the connections with the corresponding ReMESs, some targets are not connected to any statistical measure.

This is the case of the targets concerning agricultural productivity (2.3), genetic diversity maintenance (2.5), national and regional development planning strengthening (11.a), integrated policies and plans (11.b), climate-change-related planning (13.b), marine and coastal ecosystems management and protection (14.2), equitable sharing of benefits from genetic resources (15.6), and biodiversity and ecosystem value integration into national and local planning (15.9).

4. Discussion

ReMESs alone show a correspondence with 47% of the total SDGs. This result confirms the high potential of ecosystem services to support sustainability objectives [31].

The linked SDGs explicitly address the fight against climate change, as well as biodiversity and human health enhancement. This aspect is supported by what is universally recognized in terms of ReMES outputs [74,80–82]. As also stated by [28], ecosystem services contribute to a wide range of SDGs. Regulating services are no exception. Specifically, our study shows that, from an SDG level, ReMESs support almost half of the objectives set by the UN to reach sustainable development. Nevertheless, such a percentage does not refer to the totality of the targets associated with each SDG.

The number of connections drops to 20% when considering the SDG targets, which articulate themselves into the actions that must be adopted to achieve the goals they are related to, acquiring a more detailed character [83,84]. The results obtained by deepening the connections between ReMESs and the SDG targets further confirm what was discovered by [27]. A single ecosystem service can support the achievement of multiple SDG targets. This is due to the extremely heterogeneous nature of the outputs offered by ecosystem services. Nevertheless, while extreme variability certainly represents a strength when

considering ESs, this is not true when such a broad concept is used to address planning policies and actions, in which multiple factors influence their evaluation [85].

Considering the connections associated with the SDG targets, the high linkages related to target 2.4 must be traced back to the elements that contribute to the number of connections referring to the resilience aspect, the capacity to strengthen the adaptation to climate change, and the improvement in soil quality. Similarly, the less connected targets (2.3, 2.2, 2.1, 3.3, 3.4, 11.5, 14.4, 14.7, and 15.2) show little correspondence due to their specific articulation, for which only one or two ReMESs subtend the processes that supply and measure such a contribution.

From the most "programmatic" target evaluation, several studies have widely considered introducing specific ReMES features to support territorial planning. This condition has been highlighted by the references used to deepen this specific type of connection [73–79]. In this regard, target 15.9 shows the highest number of linkages. This aspect must be traced back to its explicit reference to the introduction of biodiversity and ecosystem values into national and local planning.

However, there is still a lack of evaluation of the degree of integration of biodiversity and ecosystem values in national and local planning from all the targets considered. The UN-IAEG-SDGs indicators analyze the targets with appropriate statistical measures to represent the global condition accurately. Nevertheless, an in-depth analysis is not present for the single states, which lack indicators aimed at describing the current condition of the national and local planning implementation.

In this regard, the results suggest the need to deepen and propose national statistical measures to quantify the aspects related to the targets 13.2, 11.a, 11.b, 13.b, and 15.9. This outcome emphasizes vulnerabilities within the study area, as well as in other countries. For example, as stated by [86], SDG 11 still lacks three-quarters of the information needed to assess its progress. This also applies to their study area, Hainan Province, for which an urban sustainable development assessment framework has been realized.

To facilitate future implementation actions, it is important to emphasize current research directions that can help address the identified gaps. Several authors are currently deepening the implementation of the concept of ecosystem services in local planning. Ref. [87] has already assessed the level of inclusion of ESs in urban plans of 22 Italian cities. A condition emerged in which this concept is already conveyed by several actions undertaken in local plans. Nevertheless, some ESs such as "waste treatment" and "moderation of extreme events" are not considered enough. This entails a condition in which, despite being widely addressed, these specific categories of ESs are still not fully assessed and implemented.

This aspect has also been found in the western Switzerland regional spatial plans, in a study conducted by [88] to assess the level of integration of ESs inside spatial planning. Here, the methodology envisaged the use of direct content analysis, deepening the planning documents.

Similarly, Ref. [89] proposed the IUES (Urban Ecosystem Services Index) to support urban planning and human well-being in cities.

Although the assessment of the level of integration of biodiversity and ecosystem values into national and local planning is a critical step, it remains a global unresolved issue. This leads to several considerations. From the last SDG report (2023), several SDGs are still far from being achieved. Specifically, the 2nd, 11th, 14th, 15th, and 16th SDGs show a stagnation. Furthermore, the SDG targets associated with food and land systems are particularly off track. This situation remains unchanged for both countries with a lower total SDG performance score (such as Italy), as well as for those more virtuous in reaching these objectives.

Finland (the country with the highest SDG performance score) shows a stagnation of the 13th and the 15th SDGs. This study found a lack of connections between the SDG objectives associated with the 13th and 15th SDGs and the statistical measures analyzed. Moreover, Finland is still facing several threats that hinder the accomplishment of such

SDGs [23]. Deepening such connections would guarantee a more detailed framework of the SDGs that countries are struggling to reach, contextually supporting and monitoring them through the ES concept. These considerations can also be made for Sweden and Denmark, the second and third countries with the highest SDG performance scores. In these countries, certain SDGs are still not progressing as they should.

Finally, the last linkages with ISTAT indicators show the percentage of related statistical measures of 18%. The most related aspects concern goal 6 on water quality and 13, concerning measures to combat climate change. In these goals, the activity of the ReMESs can be quantified in detail, as the associated targets (6.3, 13.2, and 13.1) are directly related to aspects closely linked to the services themselves (water quality, greenhouse gas emissions, exposure to landslide/flood risk, temperature anomalies, and so on) [82]. Nevertheless, there are targets under the same goal that are poorly or not at all quantified through statistical measures, whose attention is focused on the maintenance of genetic diversity (2.3, 2.5, and 15.6), strengthening the relationships to achieve integrated territorial planning (11.a, 11.b, and 15.9), and supporting a healthy status of marine and coastal ecosystems (14.2). What emerges is poor attention to the integrated management of the ecosystem services concept as an element through which to enhance and build an integrated and sustainable planning policy [90]. Specifically, the emergency nature of territorial dynamics has a predominant role. This aspect can be traced back to the connections with the "regulation of baseline flows and extreme events" and "regulation of soil quality" services. The higher number of linkages between the SDG targets and the first ES (9 out of 17 SDGs), compared to the lower connections with soil quality (5 out of 17 SDGs), entails greater attention towards extreme event adaptation aspects. Nevertheless, as already stated by several authors [65], linking soil health and ReMESs is a key step towards SDG achievement, also considering their potential in managing extreme events [91]. Despite there being different initiatives present aimed at defining actions to restore ecosystems [92], Europe still lacks a soil law, which could be fundamental to approach the above-mentioned issues from an a priori perspective.

From the totality of connections, it is possible to observe several correspondences between the 2030 Agenda and the ReMESs. Nevertheless, both at the international and the local level, there is no direct quantification of either certain aspects related to ESs or of the level of integration of this concept into national and local planning.

The evaluations carried out so far show that, in achieving sustainability policies, policymakers should focus on ReMESs' potential in supporting SDGs. First, it is important to carry out a content analysis of the local and superordinate planning documents to describe the level of integration between ReMESs and SDGs. If low or missing, policymakers should include strategic directions based on ReMESs' contribution to SDGs and SDG targets. At a more detailed level, this principle should be translated into a series of actions aimed at quantifying the achievement of the SDGs through the linked ReMESs.

Therefore, the identification and introduction of ad hoc indicators is essential to support the procedures for guiding and monitoring sustainability policies in the governance process. In this regard, a recent study conducted by Hu et al. [93] integrated ESs into SDG assessment by associating the values of 11 ESs with 12 SDGs through an ES–SDG index score. If extended to all types of ESs and related SDG targets, this work would represent a fundamental step towards an integrated management of sustainability policies.

Finally, it is important to acknowledge other limitations that may affect the generalizability of the study. First, to set up the connections, only the ReMESs that have a recognized contribution both to the SDGs and to the associated targets have been considered. This way of setting the methodology has been possible thanks to the observed correlation between the potentialities of using ecosystems and their services to achieve some of the objectives set by the 2030 Agenda [30].

Furthermore, ReMESs are defined as all the ways (biotic and abiotic) through which living organisms condition the environment, relative to human health, safety, or comfort. Therefore, with the ReMESs being focused on these aspects, the connections exist only for 8

out of 17 SDGs. For this reason, the considered outputs have no linkages with the aspects entailed by the left-out SDGs such as quality education and gender equality [32]. The latter does not address the enhancement of the environmental biophysical conditions [32]. Nevertheless, linkages with these SDGs could still be deepened considering other typologies of ESs such as cultural and provisioning services or expanding the connections to the side effects provided by the considered groups of ReMESs [94,95].

5. Conclusions

In this study, the convergences between ReMESs and the sustainable development goals have been deepened. The methodology allowed us to deepen the concept of ecosystem services both as a support to the SDG targets and as an element through which national and local policies can reach sustainable development goals.

From an operational point of view, the ReMESs concept, together with its connections with the SDG targets and ISTAT indicators, can be useful to frame the progress made relatively to every territorial scope, contextually supporting the achievement of the SDGs, implementing a first, fundamental introduction of the ESs concept inside territorial planning.

Furthermore, the proposed statistical measures, whose definition started from the indicators produced by the UN-IAEG-SDGs, allow the comparison with an international monitoring system, making this procedure valuable also for other contexts.

Nevertheless, the identified "bottleneck effect", resulting in a significant decrease in connections proceeding from ecosystem services to ISTAT indicators, still constitutes a vulnerability in the implementation of the concept of ESs to advance the SDGs and targets of the 2030 Agenda. Secondly, there is the fluid nature of the outputs underlying the ecosystem services concept. Whatever the type of classification, the main difficulty behind the operationalization of some typologies of ecosystem services lies in the high subjectivity of their interpretation. CICES provides a series of services whose characteristics are potentially to be regarded as final, but the boundary will need to be defined by the priorities set at the time. Hence, despite being lowered through direct linkages, the risk of having miscomprehension between intermediate and final services still subsists, due to the presence of different stakeholders that act on the land planning process.

In this sense, attention will need to be directed to specifying what kind of final services decision-makers will want to consider.

Based on the considerations made, future studies should be established to fill the gaps identified in this study. In this sense, it is of great importance to develop a methodology that can quantify the level of integration of the ReMESs within both local (sub-national level) and over-tiered (state level) planning for all UN member states.

Another important research target to be pursued is developing a methodology to quantify the contribution of ReMESs to maintaining genetic diversity, integrated planning, and the health of marine coastal ecosystems. In this regard, the study has identified several SDG targets that will require the development of specific indicators.

Finally, to comprehensively understand ESs' contributions to supporting sustainability policies and achieving SDGs, it will be necessary to also delve into provisioning and cultural ecosystem services.

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References

1. Simensen, T.; Halvorsen, R.; Erikstad, L. Methods for Landscape Characterisation and Mapping: A Systematic Review. *Land Use Policy* **2018**, *75*, 557–569. [CrossRef]
2. Geri, F.; Amici, V.; Rocchini, D. Human Activity Impact on the Heterogeneity of a Mediterranean Landscape. *Appl. Geogr.* **2010**, *30*, 370–379. [CrossRef]
3. Rothacker, L.; Dosseto, A.; Francke, A.; Chivas, A.R.; Vigier, N.; Kotarba-Morley, A.M.; Menozzi, D. Impact of Climate Change and Human Activity on Soil Landscapes over the Past 12,300 Years. *Sci. Rep.* **2018**, *8*, 247. [CrossRef]
4. *United Nations Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement*; Fifth Session: Dubai, United Arab Emirates, 2023.
5. Carli, R.; Dotoli, M.; Pellegrino, R. Multi-Criteria Decision-Making for Sustainable Metropolitan Cities Assessment. *J. Environ. Manag.* **2018**, *226*, 46–61. [CrossRef] [PubMed]
6. Wei, F.; Knox, P.L. Spatial Transformation of Metropolitan Cities. *Environ. Plan. A* **2015**, *47*, 50–68. [CrossRef]
7. Zhou, Q.; Nizamani, M.M.; Zhang, H.-Y.; Zhang, H.-L. The Air We Breathe: An In-Depth Analysis of $PM_{2.5}$ Pollution in 1312 Cities from 2000 to 2020. *Environ. Sci. Pollut. Res.* **2023**, *30*, 93900–93915. [CrossRef]
8. Duranton, G.; Puga, D. The Growth of Cities. *Handb. Econ. Growth* **2014**, *2*, 781–853.
9. Rentschler, J.; Avner, P.; Marconcini, M.; Su, R.; Strano, E.; Vousdoukas, M.; Hallegatte, S. Global Evidence of Rapid Urban Growth in Flood Zones since 1985. *Nature* **2023**, *622*, 87–92. [CrossRef] [PubMed]
10. Alqadhi, S.; Bindajam, A.A.; Mallick, J.; Rahman, A.; Talukdar, S. Mapping and Evaluating Sustainable and Unsustainable Urban Areas for Ecological Management towards Achieving Low-Carbon City: An Empirical Study of Asir Region, Saudi Arabia. *Environ. Sci. Pollut. Res.* **2023**, *30*, 65916–65932. [CrossRef]
11. Araújo, R.G.; Chavez-Santoscoy, R.A.; Parra-Saldívar, R.; Melchor-Martínez, E.M.; Iqbal, H.M.N. Agro-Food Systems and Environment: Sustaining the Unsustainable. *Curr. Opin. Environ. Sci. Health* **2023**, *31*, 100413. [CrossRef]
12. Leimgruber, W. Environmental Unsustainability or the Cost of Civilization. In *Nature, Society, and Marginality: Case Studies from Nepal, Southeast Asia and Other Regions*; Springer: Berlin/Heidelberg, Germany, 2023; pp. 9–31.
13. Sepehriar, A.; Eslamipoor, R. An Economical Single-Vendor Single-Buyer Framework for Carbon Emission Policies. *J. Bus. Econ.* **2024**, *94*, 927–945. [CrossRef]
14. Eslamipoor, R.; Sepehriyar, A. Promoting Green Supply Chain under Carbon Tax, Carbon Cap and Carbon Trading Policies. *Bus. Strategy Environ.* **2024**, *33*, 4901–4912. [CrossRef]
15. Rapport, D.J.; Bohm, G.; Buckingham, D.; Cairns, J.; Costanza, R.; Karr, J.R.; de Kruijf, H.A.M.; Levins, R.; McMichael, A.J.; Nielsen, N.O.; et al. Ecosystem Health: The Concept, the ISEH, and the Important Tasks Ahead. *Ecosyst. Health* **1999**, *5*, 82–90. [CrossRef]
16. Su, M.; Yang, Z.; Chen, B.; Liu, G.; Zhang, Y.; Zhang, L.; Xu, L.; Zhao, Y. Urban Ecosystem Health Assessment and Its Application in Management: A Multi-Scale Perspective. *Entropy* **2012**, *15*, 1–9. [CrossRef]
17. Wang, Z.; Tang, L.; Qiu, Q.; Chen, H.; Wu, T.; Shao, G. Assessment of Regional Ecosystem Health—A Case Study of the Golden Triangle of Southern Fujian Province, China. *Int. J. Environ. Res. Public Health* **2018**, *15*, 802. [CrossRef] [PubMed]
18. Xu, D.; Cai, Z.; Xu, D.; Lin, W.; Gao, J.; Li, L. Land Use Change and Ecosystem Health Assessment on Shanghai–Hangzhou Bay, Eastern China. *Land* **2022**, *11*, 867. [CrossRef]
19. United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*; United Nations: New York, NY, USA, 2015.
20. Hák, T.; Janoušková, S.; Moldan, B. Sustainable Development Goals: A Need for Relevant Indicators. *Ecol. Indic.* **2016**, *60*, 565–573. [CrossRef]
21. Kluza, K.; Zioło, M.; Bąk, I.; Spoz, A. Achieving Environmental Policy Objectives through the Implementation of Sustainable Development Goals. The Case for European Union Countries. *Energies* **2021**, *14*, 2129. [CrossRef]
22. Fonseca, L.M.; Domingues, J.P.; Dima, A.M. Mapping the Sustainable Development Goals Relationships. *Sustainability* **2020**, *12*, 3359. [CrossRef]
23. United Nations. *The Sustainable Development Goals Report 2023 Special Edition*; The Sustainable Development Goals Report 2023; United Nations: New York, NY, USA, 2023; pp. 37–39.
24. Stoycheva, V.; Geneletti, D. A Review of Regulating Ecosystem Services in the Context of Urban Planning. *J. Bulg. Geogr. Soc.* **2023**, *48*, 27–42. [CrossRef]
25. Caprioli, C.; Bottero, M.; Zanetta, E.; Mondini, G. Ecosystem Services in Land-Use Planning: An Application for Assessing Transformation Scenarios at the Local Scale. *Smart Innov. Syst. Technol.* **2021**, *178*, 1332–1341. [CrossRef]
26. Calzolari, C.; Tarocco, P.; Lombardo, N.; Marchi, N.; Ungaro, F. Assessing Soil Ecosystem Services in Urban and Peri-Urban Areas: From Urban Soils Survey to Providing Support Tool for Urban Planning. *Land Use Policy* **2020**, *99*, 105037. [CrossRef]
27. Wood, S.L.R.; Jones, S.K.; Johnson, J.A.; Brauman, K.A.; Chaplin-Kramer, R.; Fremier, A.; Girvetz, E.; Gordon, L.J.; Kappel, C.V.; Mandle, L. Distilling the Role of Ecosystem Services in the Sustainable Development Goals. *Ecosyst. Serv.* **2018**, *29*, 70–82. [CrossRef]
28. Yang, S.; Zhao, W.; Liu, Y.; Cherubini, F.; Fu, B.; Pereira, P. Prioritizing Sustainable Development Goals and Linking Them to Ecosystem Services: A Global Expert's Knowledge Evaluation. *Geogr. Sustain.* **2020**, *1*, 321–330. [CrossRef]
29. Yin, C.; Zhao, W.; Cherubini, F.; Pereira, P. Integrate Ecosystem Services into Socio-Economic Development to Enhance Achievement of Sustainable Development Goals in the Post-Pandemic Era. *Geogr. Sustain.* **2021**, *2*, 68–73. [CrossRef]

30. Maes, M.J.A.; Jones, K.E.; Toledano, M.B.; Milligan, B. Mapping Synergies and Trade-Offs between Urban Ecosystems and the Sustainable Development Goals. *Environ. Sci. Policy* **2019**, *93*, 181–188. [CrossRef]
31. Rozas-Vásquez, D.; Spyra, M.; Jorquera, F.; Molina, S.; Caló, N.C. Ecosystem Services Supply from Peri-Urban Landscapes and Their Contribution to the Sustainable Development Goals: A Global Perspective. *Land* **2022**, *11*, 2006. [CrossRef]
32. Roy, H.-Y.; Potschin, M. Common International Classification of Ecosystem Services (CICES) V5.1 Guidance on the Application of the Revised Structure. 2018. Available online: https://www.zemeunvalsts.lv/documents/view/8b6dd7db9af49e67306feb59a8bdc52c/Common%20International%20Classification%20of%20Ecosystem%20Services%20Guidance-V51-01012018.pdf (accessed on 4 July 2024).
33. IAEG-SDGs IAEG-SDGs—SDG Indicators. Available online: https://unstats.un.org/sdgs/iaeg-sdgs/ (accessed on 28 December 2023).
34. Strollo, A.; Smiraglia, D.; Bruno, R.; Assennato, F.; Congedo, L.; De Fioravante, P.; Giuliani, C.; Marinosci, I.; Riitano, N.; Munafò, M. Land Consumption in Italy. *J. Maps* **2020**, *16*, 113–123. [CrossRef]
35. Demuzere, M.; Orru, K.; Heidrich, O.; Olazabal, E.; Geneletti, D.; Orru, H.; Bhave, A.G.; Mittal, N.; Feliú, E.; Faehnle, M. Mitigating and Adapting to Climate Change: Multi-Functional and Multi-Scale Assessment of Green Urban Infrastructure. *J. Environ. Manag.* **2014**, *146*, 107–115. [CrossRef]
36. Lejano, R.P. Climate Change and the Relational City. *Cities* **2019**, *85*, 25–29. [CrossRef]
37. Santos, M.M.; Lanzinha, J.C.G.; Ferreira, A.V. Review on Urbanism and Climate Change. *Cities* **2021**, *114*, 103176. [CrossRef]
38. Arnell, N.W. The Implications of Climate Change for Emergency Planning. *Int. J. Disaster Risk Reduct.* **2022**, *83*, 103425. [CrossRef]
39. Di Pirro, E.; Sallustio, L.; Sgrigna, G.; Marchetti, M.; Lasserre, B. Strengthening the Implementation of National Policy Agenda in Urban Areas to Face Multiple Environmental Stressors: Italy as a Case Study. *Environ. Sci. Policy* **2022**, *129*, 1–11. [CrossRef]
40. D'Adamo, I.; Gastaldi, M. Monitoring the Performance of Sustainable Development Goals in the Italian Regions. *Sustainability* **2023**, *15*, 14094. [CrossRef]
41. Romano, B. (Ed.) *Pianificazione Sostenibile del Territorio*; Verdone Editore: Teramo, Italy, 2014; ISBN 9788896868270.
42. Romano, B.; Fiorini, L.; Zullo, F.; Marucci, A. Urban Growth Control DSS Techniques for De-Sprinkling Process in Italy. *Sustainability* **2017**, *9*, 1852. [CrossRef]
43. Fiorini, L.; Zullo, F.; Marucci, A.; Romano, B. Land Take and Landscape Loss: Effect of Uncontrolled Urbanization in Southern Italy. *J. Urban Manag.* **2019**, *8*, 42–56. [CrossRef]
44. Romano, B.; Zullo, F.; Saganeiti, L.; Montaldi, C. Evaluation of Cut-off Values in the Control of Land Take in Italy towards the SDGs 2030. *Land Use Policy* **2023**, *130*, 106669. [CrossRef]
45. Marucci, A.; Zullo, F.; Fiorini, L.; Romano, B. The Role of Infrastructural Barriers and Gaps on Natura 2000 Functionality in Italy: A Case Study on Umbria Region. *Rend. Lincei. Sci. Fis. Nat.* **2019**, *30*, 223–235. [CrossRef]
46. Sargolini, M.; Pierantoni, I.; Renzi, A.; Perna, P. Sun Life Strategia per La Gestione della Rete Natura 2000 in Umbria. 2018. Available online: https://www.amazon.it/life-Strategia-gestione-Natura-Umbria/dp/8898774230 (accessed on 4 July 2024).
47. Fiorini, L. *Progetto Life Imagine Umbria-Life19 IPE/IT/000015-Integrated Management and Grant Investments for the N2000 Network in Umbria*; del Dipartimento di Ingegneria Civile, Edile-Architettura e Ambientale dell'Università degli Studi dell'Aquila: Aquila, Italy, 2022; p. 36.
48. Ronchi, S.; Arcidiacono, A.; Di Martino, V. Il Progetto Soil4Life. In *Consumo di Suolo, Servizi Ecosistemici e Green Infrastructures: Metodi, Ricerche e Progetti Innovativi per Incrementare il Capitale Naturale e Migliorare la Resilienza Urbana*; Rapporto CRCS 2022; INU Edizioni: Roma, Italy, 2022; pp. 253–257, ISBN 8876032339.
49. Salata, S.; Giaimo, C.; Alberto Barbieri, C.; Garnero, G. The Utilization of Ecosystem Services Mapping in Land Use Planning: The Experience of LIFE SAM4CP Project. *J. Environ. Plan. Manag.* **2020**, *63*, 523–545. [CrossRef]
50. Giaimo, C.; Salata, S. Ecosystem Services Assessment Methods for Integrated Processes of Urban Planning. The Experience of LIFE SAM4CP towards Sustainable and Smart Communities. In *Proceedings of the IOP Conference Series: Earth and Environmental Science*; IOP Publishing: Bristol, UK, 2019; Volume 290, p. 12116.
51. Fisher, B.; Turner, R.K.; Morling, P. Defining and Classifying Ecosystem Services for Decision Making. *Ecol. Econ.* **2009**, *68*, 643–653. [CrossRef]
52. Roy, H.-Y.; Potschi, M. Classifying Ecosystem Services_HUGIN OpenNESS.Pdf. 2013, pp. 1–4. Available online: https://openness.hugin.com/example/cices (accessed on 4 July 2024).
53. Tranvik, L.J.; Downing, J.A.; Cotner, J.B.; Loiselle, S.A.; Striegl, R.G.; Ballatore, T.J.; Dillon, P.; Finlay, K.; Fortino, K.; Knoll, L.B. Lakes and Reservoirs as Regulators of Carbon Cycling and Climate. *Limnol. Oceanogr.* **2009**, *54*, 2298–2314. [CrossRef]
54. Liski, J.; Lehtonen, A.; Palosuo, T.; Peltoniemi, M.; Eggers, T.; Muukkonen, P.; Mäkipää, R. Carbon Accumulation in Finland's Forests 1922–2004–an Estimate Obtained by Combination of Forest Inventory Data with Modelling of Biomass, Litter and Soil. *Ann. For. Sci.* **2006**, *63*, 687–697. [CrossRef]
55. Rosenzweig, C.; Solecki, W.; Slosberg, R. *Mitigating New York City's Heat Island with Urban Forestry, Living Roofs, and Light Surfaces*; A Report to the New York State Energy Research and Development Authority; 2006; pp. 1–5. Available online: https://www.researchgate.net/publication/242139673_Mitigating_New_York_City%E2%80%99s_heat_island_with_urban_forestry_living_roofs_and_light_surfaces (accessed on 4 July 2024).
56. Aizen, M.A.; Garibaldi, L.A.; Cunningham, S.A.; Klein, A.M. How Much Does Agriculture Depend on Pollinators? Lessons from Long-Term Trends in Crop Production. *Ann. Bot.* **2009**, *103*, 1579–1588. [CrossRef] [PubMed]

57. Liquete, C.; Cid, N.; Lanzanova, D.; Grizzetti, B.; Reynaud, A. Perspectives on the Link between Ecosystem Services and Biodiversity: The Assessment of the Nursery Function. *Ecol. Indic.* **2016**, *63*, 249–257. [CrossRef]
58. Benvenuti, S. Weed Seed Movement and Dispersal Strategies in the Agricultural Environment. *Weed Biol. Manag.* **2007**, *7*, 141–157. [CrossRef]
59. Pinto, L.V.; Inacio, M.; Ferreira, C.S.S.; Ferreira, A.D.; Pereira, P. Ecosystem Services and Well-Being Dimensions Related to Urban Green Spaces–A Systematic Review. *Sustain. Cities Soc.* **2022**, *85*, 104072. [CrossRef]
60. Zhou, Y.; Huang, Q.; He, C.; Chen, P.; Yin, D.; Zhou, Y.; Bai, Y. A Bibliographic Review of the Relationship between Ecosystem Services and Human Well-Being. *Environ. Dev. Sustain.* **2024**, *26*, 1–28. [CrossRef]
61. McCartney, M.; Cai, X.; Smakhtin, V. *Evaluating the Flow Regulating Functions of Natural Ecosystems in the Zambezi River Basin*; IWMI: Colombo, Sri Lanka, 2013; Volume 148, ISBN 9290907630.
62. Burel, F. Hedgerows and Their Role in Agricultural Landscapes. *CRC Crit. Rev. Plant Sci.* **1996**, *15*, 169–190. [CrossRef]
63. Ruiz-Mirazo, J.; Robles, A.B.; González-Rebollar, J.L. Two-Year Evaluation of Fuelbreaks Grazed by Livestock in the Wildfire Prevention Program in Andalusia (Spain). *Agric. Ecosyst. Environ.* **2011**, *141*, 13–22. [CrossRef]
64. Frank, S.; Fürst, C.; Witt, A.; Koschke, L.; Makeschin, F. Making Use of the Ecosystem Services Concept in Regional Planning—Trade-Offs from Reducing Water Erosion. *Landsc. Ecol.* **2014**, *29*, 1377–1391. [CrossRef]
65. Adhikari, K.; Hartemink, A.E. Linking Soils to Ecosystem Services—A Global Review. *Geoderma* **2016**, *262*, 101–111. [CrossRef]
66. Duarte, C.M. Coastal Eutrophication Research: A New Awareness. *Hydrobiologia* **2009**, *629*, 263–269. [CrossRef]
67. Finlay, J.C.; Small, G.E.; Sterner, R.W. Human Influences on Nitrogen Removal in Lakes. *Science* **2013**, *342*, 247–250. [CrossRef] [PubMed]
68. Maes, J.; Hauck, J.; Paracchini, M.L.; Ratamäki, O.; Termansen, M.; Perez-Soba, M.; Kopperoinen, L.; Rankinen, K.; Schänger, J.P.; Henrys, P.; et al. *A Spatial Assessment of Ecosystem Services in Europe: Methods, Case Studies and Policy Analysis—Phase 2 Synthesis Report*; Partnership for European Environmental Research: Rome, Italy, 2013.
69. Steingröver, E.G.; Geertsema, W.; van Wingerden, W.K.R.E. Designing Agricultural Landscapes for Natural Pest Control: A Transdisciplinary Approach in the Hoeksche Waard (The Netherlands). *Landsc. Ecol.* **2010**, *25*, 825–838. [CrossRef]
70. Droby, S. Improving Quality and Safety of Fresh Fruits and Vegetables after Harvest by the Use of Biocontrol Agents and Natural Materials. In *I International Symposium on Natural Preservatives in Food Systems 709*; ISHS: Princeton, NJ, USA, 2005; pp. 45–52.
71. Humborg, C.; Conley, D.J.; Rahm, L.; Wulff, F.; Cociasu, A.; Ittekkot, V. Silicon Retention in River Basins: Far-Reaching Effects on Biogeochemistry and Aquatic Food Webs in Coastal Marine Environments. *AMBIO J. Hum. Environ.* **2000**, *29*, 45–50. [CrossRef]
72. Hassan, R. *Millenium Ecosystem Assessment Series: Ecosystems and Human Well-Being: Current State and Trends*; Findings of the Condition and Trends Working Group; Island Press: Washington, DC, USA, 2005; ISBN 1559632283.
73. Onur, A.C.; Tezer, A. Ecosystem Services Based Spatial Planning Decision Making for Adaptation to Climate Changes. *Habitat. Int.* **2015**, *47*, 267–278. [CrossRef]
74. Blum, J. Contribution of Ecosystem Services to Air Quality and Climate Change Mitigation Policies: The Case of Urban Forests in Barcelona, Spain. In *Urban Forests*; Apple Academic Press: Palm Bay, FL, USA, 2017; pp. 21–54, ISBN 1315366088.
75. Baró, F.; Gómez-Baggethun, E.; Haase, D. Ecosystem Service Bundles along the Urban-Rural Gradient: Insights for Landscape Planning and Management. *Ecosyst. Serv.* **2017**, *24*, 147–159. [CrossRef]
76. Gebre, T.; Gebremedhin, B. The Mutual Benefits of Promoting Rural-Urban Interdependence through Linked Ecosystem Services. *Glob. Ecol. Conserv.* **2019**, *20*, e00707. [CrossRef]
77. Munang, R.; Thiaw, I.; Alverson, K.; Liu, J.; Han, Z. The Role of Ecosystem Services in Climate Change Adaptation and Disaster Risk Reduction. *Curr. Opin. Environ. Sustain.* **2013**, *5*, 47–52. [CrossRef]
78. Ronchi, S.; Arcidiacono, A. Adopting an Ecosystem Services-Based Approach for Flood Resilient Strategies: The Case of Rocinha Favela (Brazil). *Sustainability* **2018**, *11*, 4. [CrossRef]
79. Inkoom, J.N.; Frank, S.; Greve, K.; Fürst, C. A Framework to Assess Landscape Structural Capacity to Provide Regulating Ecosystem Services in West Africa. *J. Environ. Manag.* **2018**, *209*, 393–408. [CrossRef] [PubMed]
80. Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being*; Island Press: Washington, DC, USA, 2005; Volume 5.
81. Sandholz, S.; Lange, W.; Nehren, U. Governing Green Change: Ecosystem-Based Measures for Reducing Landslide Risk in Rio de Janeiro. *Int. J. Disaster Risk Reduct.* **2018**, *32*, 75–86. [CrossRef]
82. Scholes, R.J. Climate Change and Ecosystem Services. *Wiley Interdiscip. Rev. Clim. Chang.* **2016**, *7*, 537–550. [CrossRef]
83. Nilsson, M.; Chisholm, E.; Griggs, D.; Howden-Chapman, P.; McCollum, D.; Messerli, P.; Neumann, B.; Stevance, A.-S.; Visbeck, M.; Stafford-Smith, M. Mapping Interactions between the Sustainable Development Goals: Lessons Learned and Ways Forward. *Sustain. Sci.* **2018**, *13*, 1489–1503. [CrossRef] [PubMed]
84. Griggs, D.J.; Nilsson, M.; Stevance, A.; McCollum, D. *A Guide to SDG Interactions: From Science to Implementation*; International Council for Science: Paris, France, 2017.
85. Wilkerson, M.L.; Mitchell, M.G.E.; Shanahan, D.; Wilson, K.A.; Ives, C.D.; Lovelock, C.E.; Rhodes, J.R. The Role of Socio-Economic Factors in Planning and Managing Urban Ecosystem Services. *Ecosyst. Serv.* **2018**, *31*, 102–110. [CrossRef]
86. Zhang, C.; Sun, Z.; Xing, Q.; Sun, J.; Xia, T.; Yu, H. Localizing Indicators of SDG11 for an Integrated Assessment of Urban Sustainability—A Case Study of Hainan Province. *Sustainability* **2021**, *13*, 11092. [CrossRef]
87. Cortinovis, C.; Geneletti, D. Ecosystem Services in Urban Plans: What Is There, and What Is Still Needed for Better Decisions. *Land Use Policy* **2018**, *70*, 298–312. [CrossRef]

88. Jaligot, R.; Chenal, J. Integration of Ecosystem Services in Regional Spatial Plans in Western Switzerland. *Sustainability* **2019**, *11*, 313. [CrossRef]
89. Pukowiec-Kurda, K. The Urban Ecosystem Services Index as a New Indicator for Sustainable Urban Planning and Human Well-Being in Cities. *Ecol. Indic.* **2022**, *144*, 109532. [CrossRef]
90. Ronchi, S. Ecosystem Services for Planning: A Generic Recommendation or a Real Framework? Insights from a Literature Review. *Sustainability* **2021**, *13*, 6595. [CrossRef]
91. Saco, P.M.; McDonough, K.R.; Rodriguez, J.F.; Rivera-Zayas, J.; Sandi, S.G. The Role of Soils in the Regulation of Hazards and Extreme Events. *Philos. Trans. R. Soc. B* **2021**, *376*, 20200178. [CrossRef] [PubMed]
92. European Commission. The EU #NatureRestoration Law. Available online: https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en (accessed on 21 May 2024).
93. Hu, S.; Yang, Y.; Li, A.; Liu, K.; Mi, C.; Shi, R. Integrating Ecosystem Services into Assessments of Sustainable Development Goals: A Case Study of the Beijing-Tianjin-Hebei Region, China. *Front. Environ. Sci.* **2022**, *10*, 897792. [CrossRef]
94. Mengist, W.; Soromessa, T.; Feyisa, G.L. A Global View of Regulatory Ecosystem Services: Existed Knowledge, Trends, and Research Gaps. *Ecol. Process.* **2020**, *9*, 40. [CrossRef]
95. Kosanic, A.; Petzold, J. A Systematic Review of Cultural Ecosystem Services and Human Wellbeing. *Ecosyst. Serv.* **2020**, *45*, 101168. [CrossRef]