# Excitonic recombination dynamics in shallow quantum wells

*Original*
Excitonic recombination dynamics in shallow quantum wells / Tignon, J., Heller, O., Roussignol, P.h., MARTINEZ PASTOR, J., Lelong, P., Bastard, G., Iotti, R.C., Andreani, L.C., THIERRY MIEG, V., Planel, R.. - In: PHYSICAL REVIEW. B, CONDENSED MATTER AND MATERIALS PHYSICS. - ISSN 1098-0121. - STAMPA. - 58:11(1998), pp. 7076-7085. [10.1103/PhysRevB.58.7076]

*Availability:*
This version is available at: 11583/1659030 since:

*Publisher:*
APS The Americal Physical Society

*Published*
DOI:10.1103/PhysRevB.58.7076

*sustainability*

*Systematic Review*

# Progress by Research to Achieve the Sustainable Development Goals in the EU: A Systematic Literature Review

**Matteo Trane [1,2,*], Luisa Marelli [1], Alice Siragusa [3], Riccardo Pollo [2] and Patrizia Lombardi [2]**

1 European Commission, Joint Research Centre (JRC), Ispra, Italy
2 Interuniversity Department of Regional and Urban Studies and Planning (DIST), Politecnico di Torino, 10125 Turin, Italy
3 European Commission, Joint Research Centre (JRC), Seville, Spain
* Correspondence: matteo.trane@ec.europa.eu

**Abstract:** Scientific research has been acknowledged to play a pivotal role in achieving the United Nations' 2030 Agenda. Vice-versa, since its adoption, the 2030 Agenda has been reinvigorating the academic production on sustainable development. This study provides a systematic literature review of the most used and newly developed approaches by academic research to support the achievement of the SDGs in the EU. The results are presented by descriptive, bibliometric, and content analysis. The descriptive analysis highlights a rising interest of scholars in operationalizing the 2030 Agenda, with a growing interest at the urban level. A text-mining tool was employed to scan the most investigated SDGs in the selected papers. Major interest by scholars is devoted to environmental concerns (especially linked to SDG 13, 7, 6, 12, and 15), while social issues (e.g., SDG 4, 5, and 10) still deserve more research. The bibliometric analysis unveiled poor intra-cluster connections, highlighting the need for more transdisciplinary research. The most recurrent research fields on the SDGs in the EU are governance, circular economy, ecosystem services, urban localization, and decision making. We advise future studies to focus on gaps highlighted and adopt a system perspective, boosting Policy Coherence across governance levels and scales of implementation by looking at trade-offs and assessing context-specific priorities.

**Keywords:** Sustainable Development Goals; Agenda 2030; achieving SDGs; European Union; SDG interlinkages; progress measurement; sustainability assessment; Systematic Literature Review

check for updates

**Citation:** Trane, M.; Marelli, L.; Siragusa, A.; Pollo, R.; Lombardi, P. Progress by Research to Achieve the Sustainable Development Goals in the EU: A Systematic Literature Review. *Sustainability* **2023**, *15*, 7055. https://doi.org/10.3390/su15097055

Academic Editor: Antonio Boggia

Received: 20 February 2023
Revised: 28 March 2023
Accepted: 30 March 2023
Published: 23 April 2023



## 1. Introduction

Approved on 25 September 2015 after two years of a global consultation with civil society organizations, scientists, academics, and citizens from all over the world, the 2030 Agenda for Sustainable Development [1] proposed 17 Sustainable Development Goals (SDGs) (see Appendix A—Table A1), along with 169 targets and 231 indicators [2]. The 2030 Agenda grounds on the Leave-no-one-behind principle, a systemic integration of social, environmental, and economic pillars of Sustainable Development (SD), and the promotion of a five P-based world (People, Planet, Prosperity, Peace, and Partnership). Coming after the Millenniusm Development Goals for 2015, the 2030 Agenda was conceived with a comprehensive follow-up and review protocol, as the United Nations (UN) recognized that "robust, voluntary, effective, participatory, transparent and integrated" [1] (p. 36) progress tracking at global, regional, and national levels vitally contributes to the implementation of the SDGs. As a consequence, robust monitoring and systematic reporting are crucial to achieving them, taking actions guided by data and statistics, and finally revealing policy gaps to be addressed [3]. Scientific research supporting policymaking plays a pivotal role in this. Indeed, research has been providing both data and approaches to assess progress at global, regional, national, and sub-national scales, as well as developing approaches to analyze interlinkages among the SDGs. These are two prominent research areas in the debate around the 2030 Agenda [4].

Regarding the first issue, sustainability measurement has been a topic of debate among researchers, policy makers, and stakeholders, further enriched by the adoption of the 2030 Agenda [5]. Reporting on the SDGs may facilitate this process, providing a comprehensive framework with goals and targets for addressing economic, social, and environmental SD, as well as suitable indicators for measuring progress against them. A great amount of cooperation across scales (from global to local) is needed for monitoring progress [6], which is often still not fully possible [7], but essential to achieving the SDGs. Furthermore, a country's relative position in SDG rankings may depend prominently on either the chosen method and indicators or aggregation method, even when the same indicators are used [5,8]. Regarding the second issue, the interrelated nature of the 2030 Agenda implies the existence of many synergies and complementarities among goals and targets, as well as trade-offs where improvements in one dimension could trigger negative results in another [9]. However, existing ranking methods do not considers interlinkages [5], although achieving the SDGs highly depends on whether synergies are harnessed properly and whether trade-offs are minimized [10]. Indeed, many authors have already pointed out that strong interdependencies between the delay in implementing one goal and repercussions in the other goals may further undermine the achievement of the SDGs [6,9,11,12].

Besides progress and interlinkage assessment, there is scientific evidence that the political impact SDGs have had on global, national, and local governance since their adoption is still limited so far [13]. Being non-legally binding, the commitment to accountability in SDG implementation has been a choice of individual governments [14]. At the same time, there is room for the SDGs to mobilize academic communities and ask policymakers for relational changes and liability [6]. On the one side, investigating complex systems such as the SDGs requires research, taking into account interdependencies among them [11]. On the other side, still more research is urgently needed on the reporting of goals as well as operationalizing the 2030 Agenda as a whole, which in turn may contribute to boosting the transformative force of SDGs in and of themselves [13]. Consequently, due to these interrelationships' complexity, it is valuable for researchers to assess new scientific knowledge around the SDGs [15] by highlighting existing contributions, major streams of research, emerging areas, and noteworthy gaps, to finally suggest possible ways forward [16] in operationalizing the UN Agenda. Indeed, given the pivotal role of research in accomplishing the SDGs [12,17,18], not having a broad vision of scientific production and its evolution makes it difficult to inform future research. Therefore, comprehensive studies are needed to facilitate the integration of scholars' contributions in order to assist the achievement of the SDGs and provide a critical perspective around them [12]. In turn, SDGs have been offering a unique opportunity to reinvigorate the international sustainability research agenda since their adoption [18], as the exponentially growing scientific production around the SDGs demonstrates [19].

Grounded on these premises and considering the enabling role of scientific research towards the 2030 Agenda operationalization, several research questions arise:

- What approaches is research using/developing to support the achievement of the SDGs?
- How is research contributing to measuring progress in the SDGs at all scales?
- Which are the most investigated Goals, Targets, and sustainability domains, and which need further research?

We have conducted a systematic literature review (SLR) to respond to these questions, with a particular emphasis on the context of the European Union (EU). Indeed, the EU has been a front-runner in shaping the SDGs and mainstreaming them into both initiatives and impact assessments to support policies, as formally pointed out by the Better Regulation Toolbox [20], thus pushing Member States towards implementing the 2030 Agenda [21]. Several valuable studies have been investigating these issues. However, they mostly focused on a single dimension of SD, such as the measure of environmental sustainability in the implementation of the 2030 Agenda [8]. Alternatively, they were focusing on specific research domains, such as SDGs and the role of the business sector [22], poverty [23], plastics [24], circular economy, degrowth, and green growth [25], sustainability science, and aspects of knowledge management [6]. When not focusing on specific topics, research is dealing with the Agenda 2030 as a whole via the bibliometric analysis of thousands of documents [19,26,27], or analyzing literature reviews [15]. Reference [17] identified the most investigated SDGs by asking scholars from different geographic regions via experts' snowball sampling, while [15] individually mapped the SDGs. No comprehensive study focusing specifically on the EU was found. As a result, this study contributes to the debate on the operationalization of the 2030 Agenda on several grounds. Given the highlighted gaps, the major novelties of this research are listed:

- It goes beyond bibliometric analysis (which is included too), providing a detailed content analysis on the approaches that scientific knowledge is using or developing to achieve the 2030 Agenda, clustering them according to hierarchical terminology in highly influential sustainability science [28], not yet linked specifically to the SDGs as far as we know. These approaches could also be intended as a proper "Means of Implementation" (MoIs) of the SDGs, which are now more contentious than the goals themselves and thus deserve much more attention in research [29] (p. 2). Finally, review exercises to link SDGs and practical applications were claimed [15];
- It adopts an interdisciplinary lens [6] rather than focusing on specific topics or siloed goals to finally report on the 2030 Agenda as a whole;
- It provides a contextualized analysis of the implementation of the SDGs in a specific geographical region, the EU, as it was claimed to be needed [17,30];
- It offers an overview of the most investigated SDGs using a text-mining, natural-language-processing, and techniques-based tool, the SDG Mapper Tool [31], not yet in use in the academic literature as far as we know. This mapping detects targets as well, which is also new to the literature. Moreover, although papers in Scopus are mapped against the SDGs via Elsevier 2022 SDG Mapping (https://service.elsevier.com/app/answers/detail/a_id/31662/supporthub/scopuscontent/, accessed on 16 May 2022), this only considers the record title, keywords, key descriptors, journal subject areas, and abstracts, while our scanning maps the whole papers, including the ones coming from Web of Science (WoS);
- It provides a qualitative overview of how research is dealing with different scales of investigation, from global to urban and intra-urban levels, highlighting emerging trends.

This paper is structured as follows (Figure 1). Section 2 presents the background regarding political entities (national governments, regions, municipalities) and ranking methods (at the EU level) for progress measurements and voluntary reporting. Section 3 covers the research methodology followed within this study. Section 4 reports on the results using a descriptive analysis (literature historical series, scale of investigation, and mapping against the SDGs); it includes a bibliometric analysis based on key-word co-occurrence; and it contains a complementary content analysis, clustering research according to the approach adopted or set and the most recurrent streams of research. Section 5 discusses the results, highlighting the limits of the research, emerging topics, major findings, and literature gaps in relation to the research questions. Section 6 concludes and presents suggestions for future research.

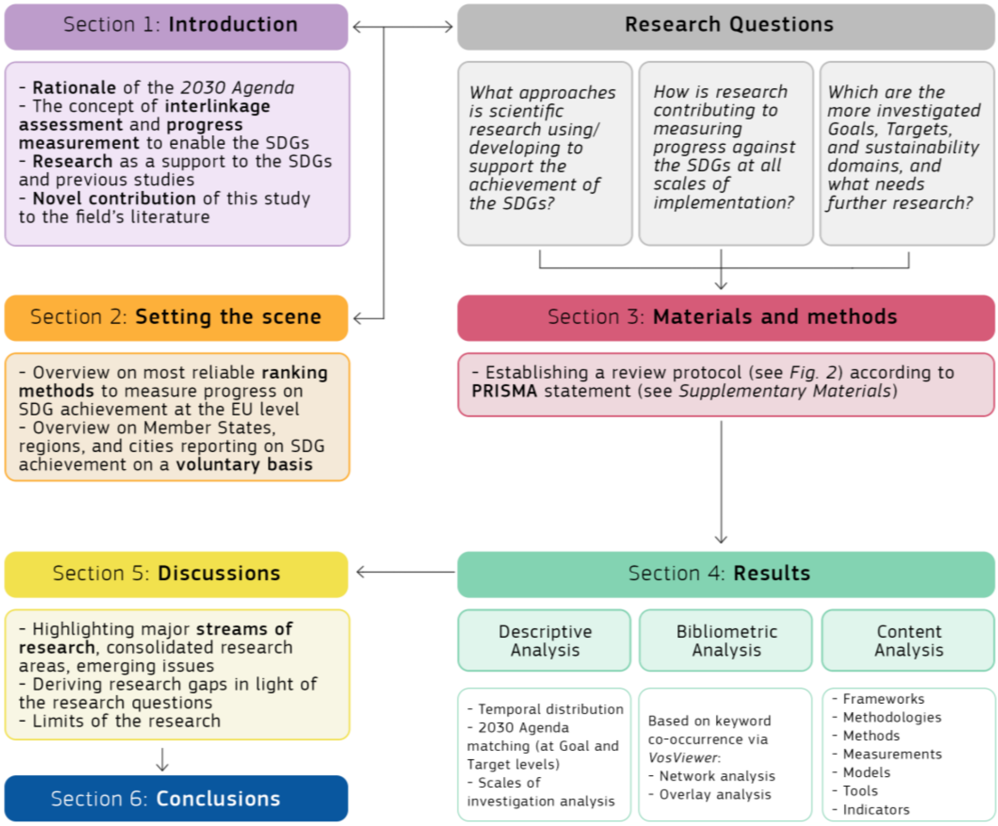


**Figure 1.** Paper's workflow (authors' elaboration).

## 2. Setting the Scene: Measuring Progress against the SDGs

The EU strongly committed itself to the SDGs with the six headline priorities set by President Von der Leyen's Commission (2019–2024), in particular by the European Green Deal [32]. The EU is thus putting effort into producing and managing high-quality data. In particular, Eurostat, the European Environmental Agency—DG Environment, and the Joint Research Centre (JRC) are the institutions contributing the most to SDG monitoring in the EU context [3].

Clear metrics and data are essential for countries to track progress and achieve the goals [3,33]. The 'European Sustainable Development Report' [34] has been monitoring the performance of all EU members, the United Kingdom, partner countries, and the EU as a whole since 2019. The OECD published the 'Measuring Distance to SDG Targets' report in 2016, 2017, 2019, and 2022 [35], grouping country trends toward the SDGs. The 'Monitoring Report on Progress Towards the SDGs in an EU Context' is published yearly [36]. The analysis builds on the EU SDG indicator set, 100 indicators developed in cooperation with a large number of stakeholders for the specific EU context and structured along the 17 SDGs. Finally, 'Measuring the Situation of the European Union with regard to the SDGs' [37] by the Italian Alliance for Sustainable Development tracks the progress of the EU on each SDG by a subset of Eurostat indicators, covering the period 2010–2017 (with 2010 as a baseline).

### *2.1. Reporting at the National Level*

The Member States report on SDGs on a voluntary basis via Voluntary National Reviews (VNRs). According to [38], during the 2021 High-Level Political Forum, 42 countries presented a VNR. Among these, eight were from Europe, 24 were at their second VNR (Cyprus, Czech Republic, Denmark, Germany, Norway, Spain, and Sweden from Europe), and 10 were at their third one. In total, 247 VNRs have been submitted to the HLPF from 2016 to 2021 and approximately 90% of UN Member States at least submitted one VNR [39]. Among the best practices identified by the 'Repository of Good Practices in

VNR Reporting', in 2020 Finland reported on the 2030 Agenda as a whole, setting its measurement around leave-no-one-behind, universality, multi-stakeholder joint work, and no-silos principles [40], and making reference to the Planetary Boundaries by the Stockholm Resilience Centre [41,42]. The 'UN Secretary-General Guidelines' [43], complemented by the 'Handbook for the Preparation of Voluntary National Reviews' [44], support the preparation of a VNR.

### 2.2. Reporting at the Sub-National Level

A crucial step towards assessing the role of EU cities in pursuing the objectives of the 2030 Agenda was established in 2020 with the first 'European Handbook for SDG Voluntary Local Reviews' (VLRs) [45], updated in 2022 [46]. It provides policymakers, urban practitioners, and experts with a set of 72 indicators (both official and experimental ones) on relevant SDG targets that local governments may use in order to monitor progress against the 2030 Agenda. The 'Handbook' is published in the 'Urban Data Platform Plus', a joint initiative by the JRC and Directorate General for Regional and Urban Policy (DG-REGIO) (https://urban.jrc.ec.europa.eu/?lng=en, accessed on 14 March 2022). The platform provides access to information on the status and trends of cities and regions, EU strategies supporting urban and territorial development, and the localization of the SDGs by encompassing several tools. An initiative from the JRC is now ongoing to set the scene for Voluntary Regional Reviews, with the first 10 pilot projects announced by the JRC [47].

## 3. Material and Methods

This paper adopts an SLR methodology to screen scientific documents on the achievement of the SDGs in the EU context. SLR is a research synthesis "conducted by review groups with specialized skills, who [. . . ] identify and retrieve international evidence that is relevant to a particular question [. . . ] and to appraise and synthesize the results of this search to inform practice, policy, and in some cases, further research" [48] (p. 2). The authors applied the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines to assist the SLR process (http://prisma-statement.org/, accessed on 16 September 2022). The PRISMA 2020 checklist and flow diagram for the review process are available (see Supplementary Materials). Specifically, the review process is further detailed in Figure 2 and was organized into three main stages [49]: Planning the review, Conducting a review, Reporting and dissemination.

### 3.1. Planning Stage

In the initial stages of the SLR, scoping studies have been conducted to assess the relevance and size of published literature and eventual gaps, thus delimiting the subject area and establishing a review protocol. The protocol arises from the research questions presented in Section 1, focusing on scientific knowledge reporting on approaches for explicitly achieving the SDGs and measuring progress against them in the EU.

A complex search string has been set by an iterative process to minimize bias, take stock of the scientific literature on the topic, and work on a consistent but limited number of papers given the extent of research published on the topic. The keyword Sustainable Development Goal* has been combined with the keyword achiev*, in order to not get broad results generally citing the SDGs. Thus, a list of keywords has been introduced as synonyms of Sustainable Development Goal* (i.e., Agenda 2030, SDG*) and achiev* (i.e., attain*, implement*, localiz*, mainstream*), resulting in a 30-keyword search string (see Appendix A—Table A3).

### 3.2. Conducting Stage

This stage involved systematic research on both Scopus and WoS, covering all articles published from 2015 to 2022 (April). This period aligns with the adoption of the *2030 Agenda for Sustainable Development* by Heads of State and Government. In Scopus, the search string was applied to the article title, abstract, and keywords fields, while in WoS, the search string was applied in the topic domain. In both databases, only Open Access and English-written papers have been selected. As for the document types, the research was further framed by selecting article, conference paper, review, book chapter, book, or data paper in Scopus, while in Web of Science, we narrowed the selection to articles, review articles, proceedings papers, early access, book chapters, or data paper. In the Scopus database, a total of $n$ = 797 documents were retrieved, while $n$ = 719 were retrieved in WoS. A total of $n$ = 899 documents constitute the initial paper database, as papers present twice were removed.

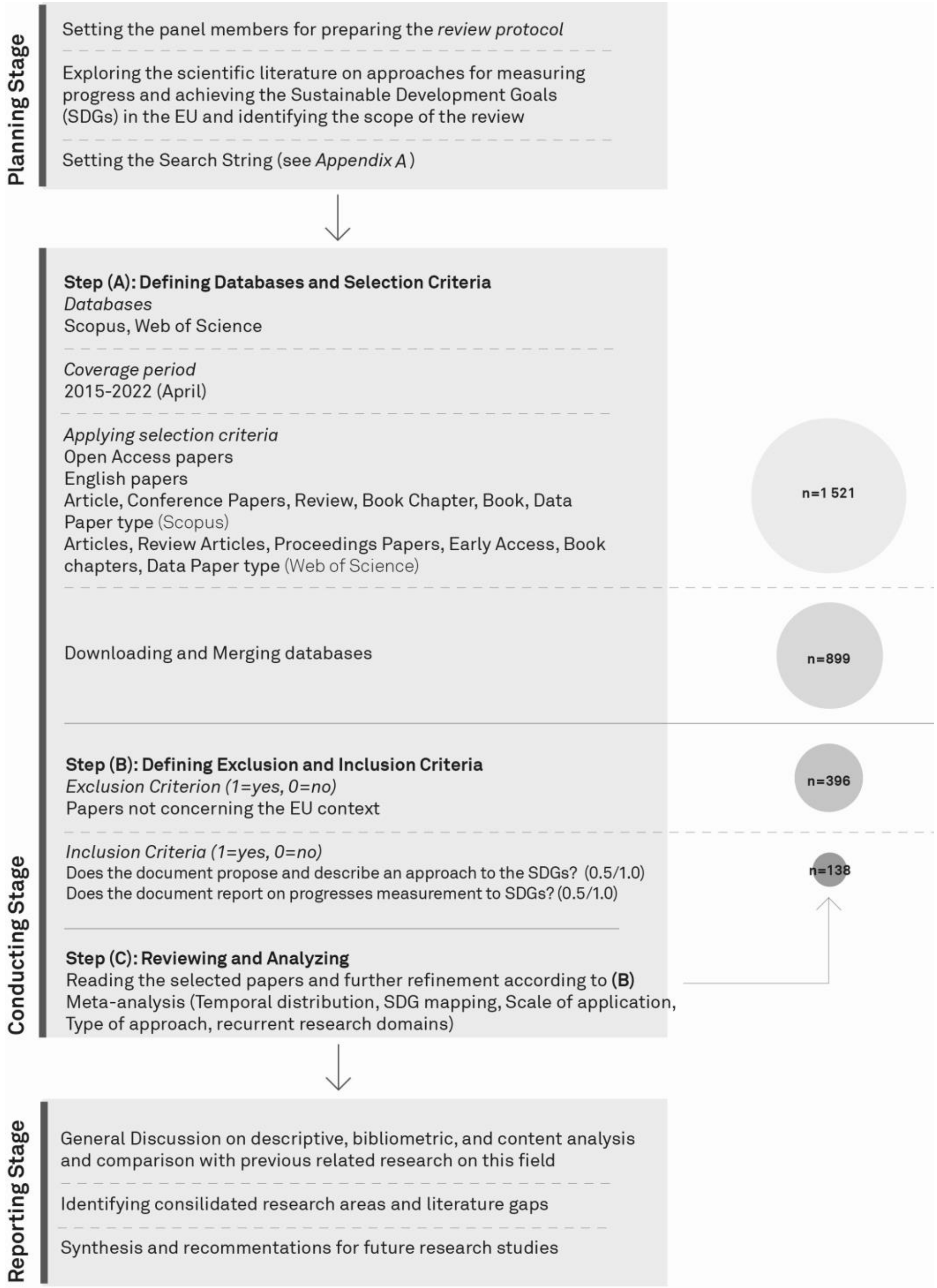


**Figure 2.** Systematic literature review protocol (authors' elaboration).

A first exclusion criterion was applied by reading abstracts and titles, thus scoring the papers in a binary system (1 = yes, 0 = no) and excluding papers reporting on specific case studies outside the EU context (0 scores). However, papers of a general nature (e.g., providing a framework for analyzing the water-food-energy nexus) were considered as well. After this first refinement, the database was composed of $n$ = 396 papers. An inclusion criterion was introduced to further narrow the selection, responding to at least one of the two questions (0.00 = no in both questions, 0.50 = yes in one of the two questions, 1.00 = yes in both questions):

- Does the paper propose/use and describe an approach assisting the achievement of one (or more) SDG(s)?
- Does the paper report on progress towards the achievement of one (or more) SDG(s) at the EU, regional, national, or sub-national level?

After finalizing the process, $n$ = 152 documents were included in the review. Finally, 14 of them were excluded as they did not describe the approach mentioned, or they were found to be not concerning the EU context after reading. As a result, 138 documents constitute the database of this review. Previous research on the topic is acknowledged too (Sections 1, 5 and 6).

Descriptive analysis reports on literature historical series, the spatial scale of investigation, and mapping against the SDGs. As for spatial scale analysis, all selected papers were clustered, when applicable, in global, EU, national, sub-national, urban, intra-urban, and rural scales. We used the SDG Mapper tool from the KnowSDG Platform by the JRC (https://knowsdgs.jrc.ec.europa.eu/, accessed on 6 June 2022) to match papers with the 2030 Agenda goals and targets. This allows us to have a stronger overview of most investigated SDGs than attributing papers to certain goals based on our personal feelings, as well as go beyond goals and detect targets, too. This open-source web-based application has been already used for mapping the European Green Deal policies against the SDGs and adopts a text-mining, keyword-based approach [31]. It allows users to map any document on both goal levels and target levels in real-time in order to identify semantic links between documents and the 2030 Agenda. One can also download results about the individual or aggregated document mapping in table format for further in-depth analysis, as well as a final summary report. Bibliometric analysis of keywords' co-occurrence was performed by VosViewer.

Finally, content analysis was performed [50]. Given the extent of the scientific production and the heterogeneity of emerging sustainability domains, systematizing knowledge was needed. To do this, we employed the hierarchical terminology for approaches to sustainability science reported in Figure 3, adapted from [28,51]. This was due to our desire not to present the results according to individual goals, in order to avoid siloed analysis, but rather emphasize the intertwined nature of the SDGs and report on the 2030 Agenda as a whole. Moreover, according to the mapping results (Figure 4), papers may refer to several SDGs at the time, which would not allow for easy clustering of them per goal. In addition, the highly influential terminology adopted constitutes a way to report on different approaches from highly heterogeneous research domains. As such, selected papers fit the proposed structure. Considering that each type of approach is given a sub-paragraph in the results section, papers may appear more than once (e.g., when reporting on a methodology, related methods, and resulting measurements). Relevant and recurrent fields of investigation were identified per each type of approach as well to highlight consolidated streams of knowledge, emerging areas, and research gaps.

### 3.3. Reporting and Dissemination Stage

This stage is meant to discuss the findings, identify major gaps, and elaborate concluding remarks, thus paving the way for future research and implementation. The discussions of the results highlight consolidated scientific knowledge areas, emerging topics, and gaps in relation to the three research questions. Based on this, major recommendations are reported in the Conclusions to advance research supporting the achievement of the SDGs.

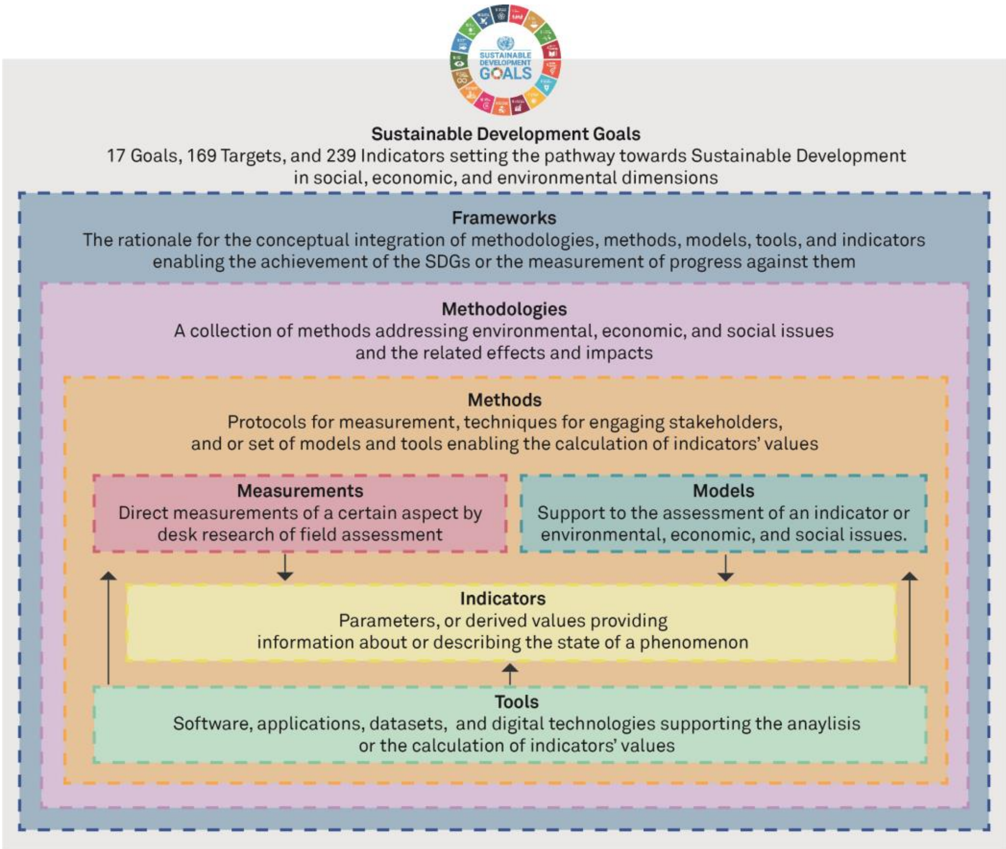


**Figure 3.** Hierarchical terminology adopted for clustering the approaches retrieved in the selected papers for detailed content analysis (authors' elaboration, terminology based on [28]).

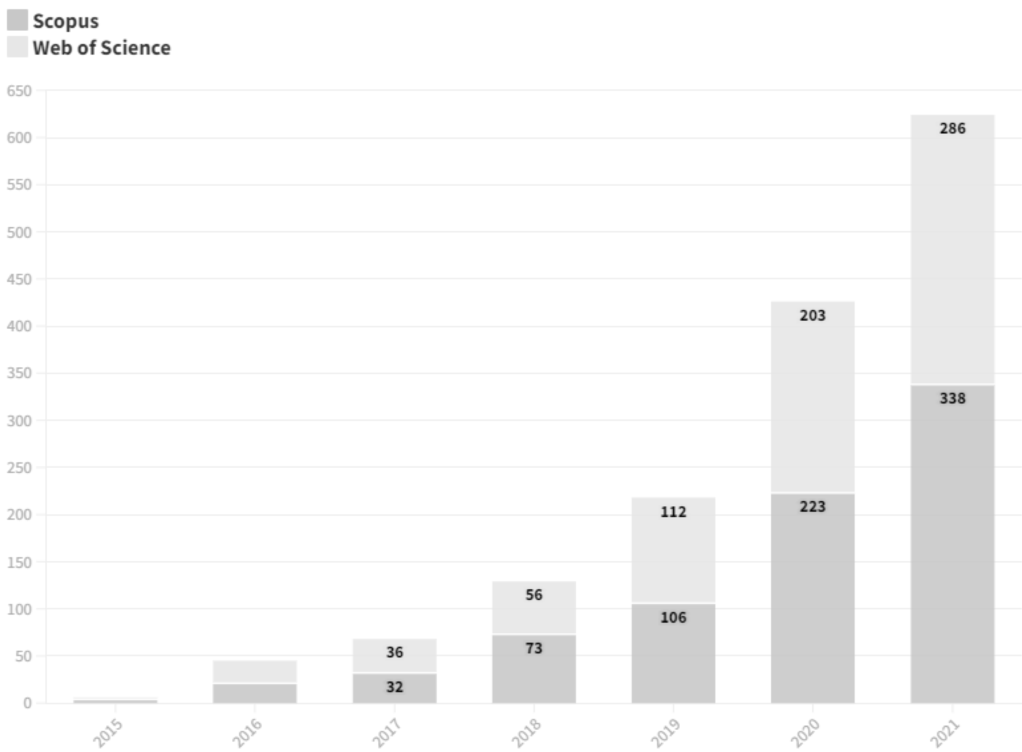


**Figure 4.** Temporal distribution of papers responding to the search string (authors' elaboration via https://flourish.studio/, accessed on 16 January 2023.

## 4. Results

### 4.1. Descriptive Analysis

Figure 4 highlights the annual distribution of all papers from Scopus and WoS, responding to the search string on approaches by scientific research supporting the achievement of the SDGs. The topic is gaining momentum, and at the time this manuscript is finalized (September 2022), 430 new papers have already responded to the search string in Scopus. Figure 5 reports on how selected papers are matching the 2030 Agenda at the goal level, while Figure 6 focuses on the target level, reporting only on target-related keywords with more than 200 "occurrences" in all documents (see Appendix A—Table A2 for the full name of the most detected targets). All SDGs were matched, as well as more than 90% of targets (no matches for target 1.a, 1.b, 3.c, 10.5, 10.a, 11.c, 12.a, 13.b, 14.a, 14.b, 15.c, 16.2, 16.9, 17.3, 17.4, 17.5, 17.12) (for the complete target list: https://sdgs.un.org/goals, accessed on 15 September 2022).


**Figure 5.** Occurrences of 2030 Agenda Goals-related keywords in all selected papers (authors' elaboration based on the SDG Mapper Tool).

After reading the selected papers (Table 1), a proper scale of investigation was identified (Figure 7), if applicable. The national scale is still the most investigated, but urban studies are growing fast. Papers at the EU scale often adopted a global perspective (and vice-versa). Poor attention to small rural centers was highlighted. A deeper analysis was conducted to link the scale of investigation to the time of publication to eventually detect any trend (Figure 8). Papers before 2018 were mostly setting the scene for further studies on actual SDG implementation across governance levels and research domains ("Not applicable"), so they were not included in this analysis.

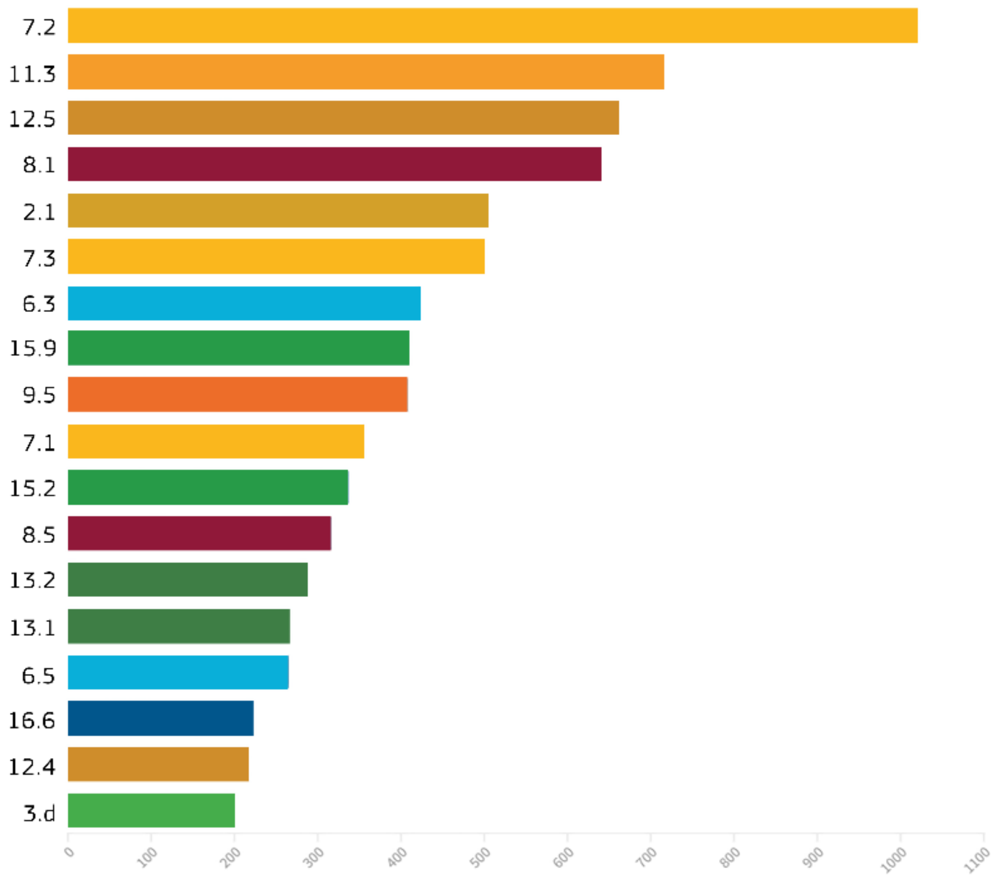


**Figure 6.** Occurrences of 2030 Agenda targets-related keywords (>200) in all selected papers (authors' elaboration based on the SDG Mapper Tool).

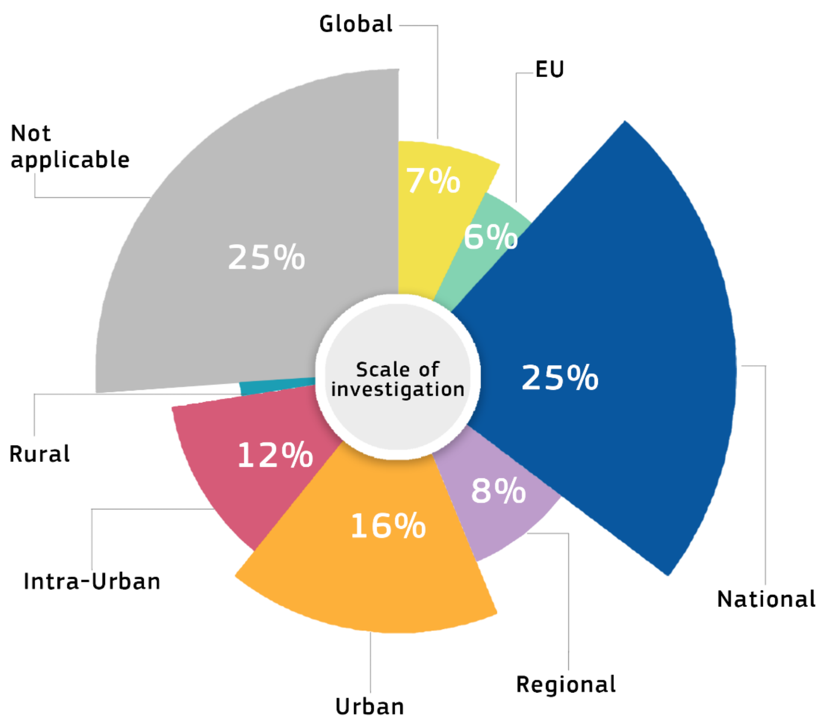


**Figure 7.** Scale of investigation in selected papers (authors' elaboration).

**Table 1.** List of selected papers.

| Year of Publication | Reference |
|---|---|
| 2015 | [52] |
| 2016 | [53–55] |
| 2018 | [6,29,56–72] |
| 2019 | [5,73–97] |
| 2020 | [98–131] |
| 2021 | [14,87,132–183] |
| 2022 | [184] |

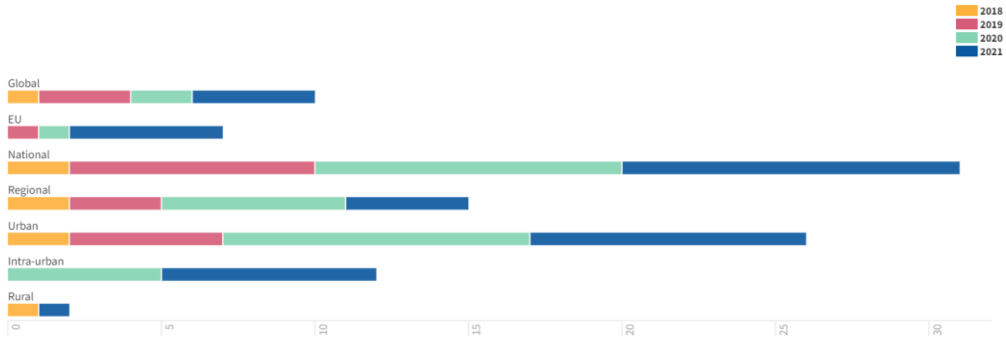


**Figure 8.** Temporal trend of the scale of investigation in selected papers (authors' elaboration via https://flourish.studio/, accessed on 16 January 2023).

### 4.2. Bibliometric Analysis

Bibliometric analysis is meant to explore the conceptual structure in the research field [185]. In total, 342 keywords were extracted from the selected papers in Scopus and WoS by a RIS file via the Mendeley Reference Manager. The minimum occurrence number of a keyword was set as 2 (51 keywords in total), and 8 clusters were obtained (Figure 9). The size of the nodes refers to the keyword occurrence, while line thickness is linked to the strength of the pair of keywords. "Climate change" is the keyword with the most occurrences (6 times), followed by "Indicators", "Circular Economy", and "Implementation" (5), "Environment", "Socio-ecological systems", "Innovation" and "Sustainable Development" (4), and "Construction Industry", "Waste Management", "Remote Sensing", and "Water Management" (3). The strongest keywords related to "Sustainable Development Goals" are "Environment" (16 points), "Climate change" (14), "Indicators", "Cross-sectoral engagement", "Determinants of Health", "Equity", "Governance", and "Socio-ecological Systems" (12), "Sustainable Development" (11), and "Circular Economy" and "Construction Industry" (9). The overlay visualization (Figure 10) shows the time trend of keywords.

### 4.3. Content Analysis

This section provides a detailed outlook of what MoIs are developed or mostly used by academic research to assist the achievement of the 2030 Agenda and report on specific progress measurements. As stated, MoIs are presented by adapting the terminology proposed in Figure 2, reporting on the contribution of scientific research to the implementation of the 2030 Agenda as a whole. In addition, recurrent relevant fields of investigation have been detected *a posteriori* throughout the scientific literature in order to make major streams of research on SDG achievement emerge. They concern *governance*, *circular economy*, *ecosystem services*, *education and culture*, *urban localization*, *decision making*, *interlinkage assessment and prioritization*, *progress assessment*, and *financial* (plus *other*) domains. Thus, Figure 11 highlights the matching between MoIs and recurrent research domains per number of papers.

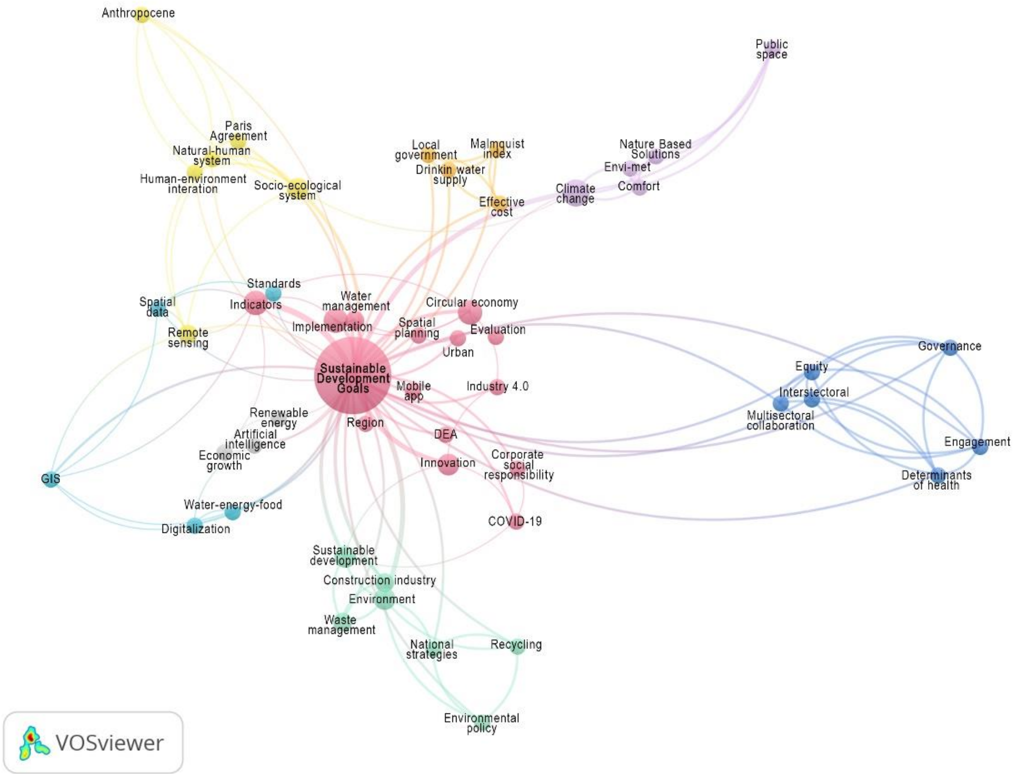


**Figure 9.** Network visualization on keyword co-occurrence (authors' elaboration based on VOSVievwer).

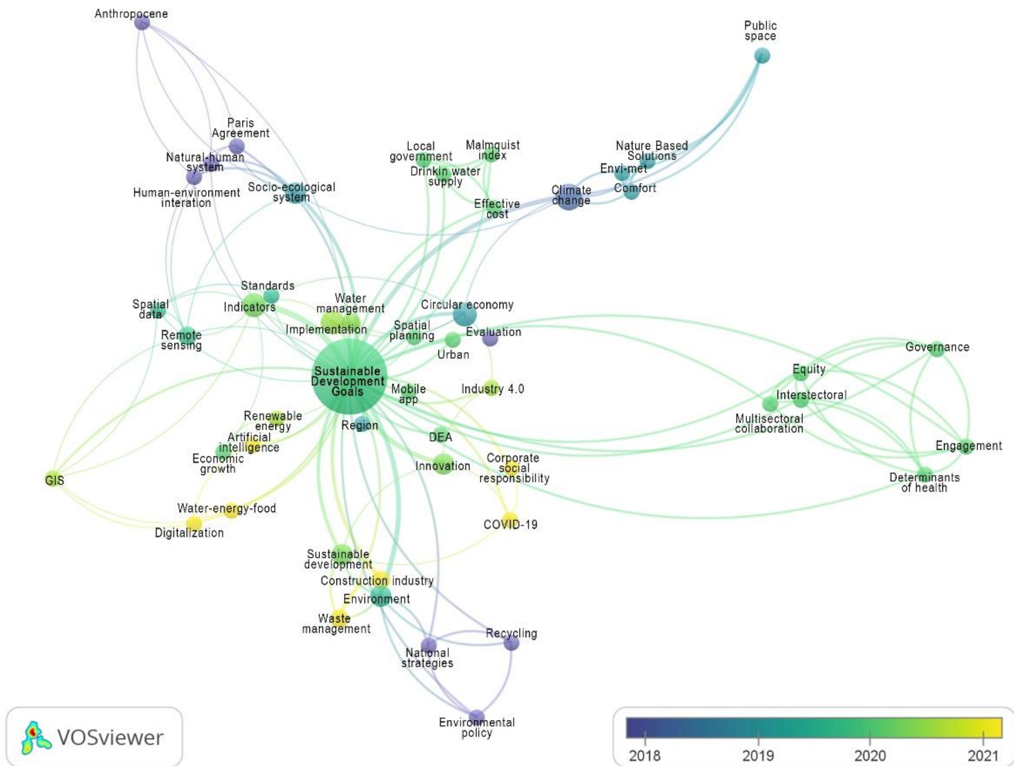


**Figure 10.** Overlay visualization on keyword co-occurrence (authors' elaboration based on VOSVievwer).

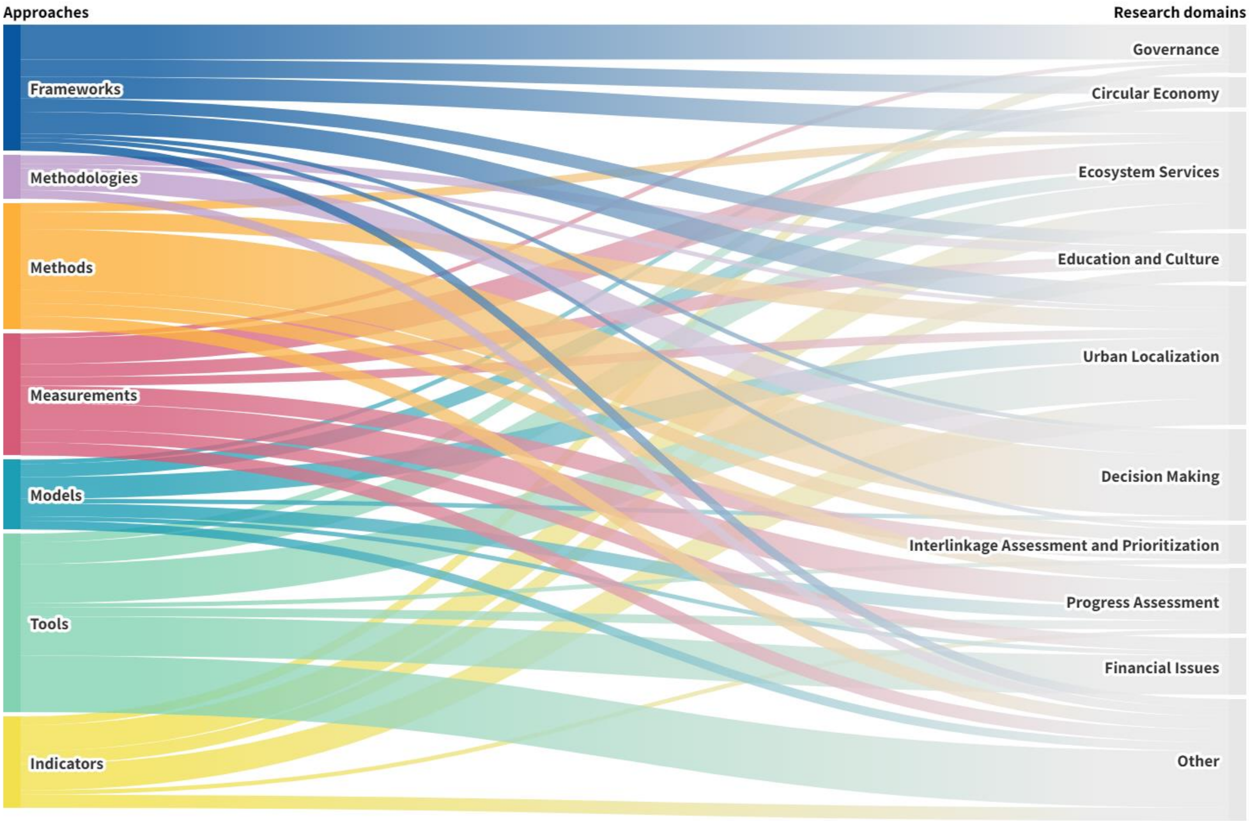


**Figure 11.** Qualitative overview on the approaches and most recurrent research domains based on the number of papers (authors' elaboration via https://flourish.studio/, accessed on 16 January 2023).

#### 4.3.1. Frameworks

**Governance** is the way Agenda 2030 will be translated at national and subnational levels, thus its importance for SDG achievement is incontestable [52]. Governance for Agenda 2030 encompasses four domains: participation, reflexivity and adaptation, democratic institutions, and policy coherence [73]. The 'Framework for policy coherence for Sustainable Development' by OECD "shall help policy-makers to adapt institutional arrangements and processes in order to increase coherence in policy design and implementation" [73] (p. 3). The concept of "Metagovernance" was further introduced, i.e., the "Governance of Governance" [132], the governance of basic governance styles (hierarchical, network, market). Five approaches to Governance emerged in the framework proposed by [133] for operationalizing SDGs: (i) the construction of normativity to translate global goals into local contexts and back; (ii) the extension of the sustainability concept as a model for society; (iii) policy integration and analysis of interactions; (iv) the involvement of social actors; and (v) the need to orient individual and collective choices to restore production and consumption patterns. The framework by [132] recognized four priority issues for improving institutional capacity towards the SDGs (making public administration and governance a strategic policy area, starting reforms to promote effective public administration and governance, applying meta-governance of governance styles, and overcoming silo mentality). A framework for "Implementation, Monitoring, and Finance" was proposed by [29] as a starting point to hold governments, international organizations, and non-state actors accountable. An "Integrative Framework" to design and implement SDGs for sustainability transformation in four stages (inform; activate; innovate; and transform) was proposed by [98]. Finally, a three-module Novel ICT Framework [74] was proposed: data, sustainability, and governance, providing adaptive, network, collaborative, fair, accountable, and trustworthy governance.

The **Circular Economy** (CE) is an umbrella concept requiring a paradigm shift [134], thus a pre- and necessary condition for SDGs. Reference [56] performed a literature review on CE with a specific focus on sustainable supply chain management research. The "House of Sustainability" framework highlights the interconnections between CE and Industry 4.0 tools [135]. In [136] they proposed a conceptual framework for the transition toward resource use efficiency (smart innovations; resource use efficiency in industrial ecology, water reuse, cleaner production, and renewable energy; achieving SDGs by reusing, reducing, refurbishing, recycling, repairing, and remaking).

As for **Ecosystem Services** (ES), a conceptual framework was provided [75] to analyze spatial relationships between ES and SD. Interdisciplinary research in support of conservation policies to finally safeguard mountain integrity was highlighted in a conceptual framework based on the Humboldtian approach (i.e., on a transdisciplinary view of nature and human society) [76]. The framework for "No Net Loss Policies" [77] was set to extend the "global mitigation hierarchy" for the nature conservation concept [186], focusing on mitigating the biodiversity impact of an infrastructural expansion. An operational framework for improving water governance is provided by [99], while [57] proposed a framework for a theory of change to drive agricultural transformation under climate change. Reference [100] proposed a holistic and systemic framework at a human ecology perspective, showing how studying the interrelations between biotic and abiotic factors; cultural, social, and individual human factors; and artifacts delimited by situations, habitats, or larger ecosystems may endorse radical societal change for the SD.

Given the tremendous role of **Education and Culture** in promoting the 2030 Agenda and a more sustainable society [137,138] set a theoretical framework for implementing the SDGs in university programs. Focusing on achieving target 4.7, Reference [78] designed a youth-led framework for monitoring SDG achievement. Reference [139] twinned the U-I-G Triple Helix framework for Innovative Development (University-Industry-Government) with a U-P-G (University-Public-Government) Triple Helix.

As for the **Urban localization** domain, Reference [79] set a conceptual framework for a 'Health-in-All-Policies' approach informing and improving transport and urban planning, considering Urban Health as a catalyst toward all SDGs. A six-level framework was proposed by [80] to localize SDGs (map the system, set a vision with goals and indicators, identify strategic guidelines, take action, identify and elaborate tools for implementation, and perform planned readjustment based on monitoring and reporting systems). A framework for clustering urban surface use as a means to boost climate resiliency was set by [101]. Reference [102] developed a framework for classifying existing energy models for building stock, enabling the comparison among them across different scales (cities, regions, and countries). The concept of integrated spatial and energy planning was mentioned by [103] to address the interrelation between spatial structures and shape the energy transition by assessing the spatial dimension of energy demand and energy supply in a holistic way. The Prediction-Adaptation-Resilience framework was introduced to support urban planners and local administrators to foster urban resilience, climate adaptation and mitigation, and SD from a socioeconomic and environmental perspective [140].

In the field of **Decision Making**, Reference [58] reports on a framework for Spatial Multi-Criteria Decision Analysis, consisting of an Intelligence Phase (problem definition), a Design Phase (a decision matrix), and a Choice Phase (sensitivity analysis).

In the field of **Interlinkage Assessment and Prioritization**, the approach by [59] triangulates across methods of critical analysis, conceptual modeling, and keyword network analysis to derive seven "overarching directions" that could provide a prioritization framework to implement the SDGs.

In **Other** domains, the Ecocentric Management Mindset framework [141] was drawn to drive multinational enterprises to implement corporate sustainability initiatives and achieve the SDGs. Finally, the concept of bioeconomy was implemented at the political level in the EU in 2012 [142]. "Since the bioeconomy is being used as a means to meet SDGs, a bioeconomy transition should be planned and evaluated in an SDG context" [104] (p. 2).

In this perspective, reference [104] provided a systems-archetype mapping framework using systems engineering for sustainable bioeconomy transitions.

#### 4.3.2. Methodologies

MCDM (Multiple-Criteria Decision-Making) techniques refer to the research field of Decision Support systems [58] facilitating the **Decision-Making** process. Reference [143] carried out a literature review on MCDM supporting the achievement of SDGs, clustering them into utility-based, compromise, multi-objective decision making, outranking, and other methodologies. Cross-impact analysis "combines a qualitative interactions assessment facilitated through cross-sectoral dialogues and quantitative network analysis to single out the most important information for strategic decision-making concerning target interactions and achieving the SDGs", to finally foster the "policy coherence" across different policy domains [81] (p. 5). The most established methodology for this is Impact Assessment (IA). The most used IA methodologies in the European Commission legislation are model-based technical studies [81]. Among these, Life Cycle Assessment (LCA) is a widely accepted method capturing overall impacts on the environment for any given activity, although integration of LCA for Decision Making (DM) is still to be explored [144].

In the **Education and Culture** domain, [187] provides a concise five-step methodology for incorporating SDGs into universities, while [145] proposed a four-step methodology to integrate the 2030 Agenda in universities.

In the **Urban Localization** domain, Health Impact Assessment could advance SDGs related to Urban Health according to [80].

In **Other** domains, Citizen Science (CS) is a methodology involving volunteers in the scientific process for data collection, and it has been used extensively for environmental monitoring purposes [146]. CS must comply with the ten principles established by the European Citizen Science Association [188], and in the context of the SDGs, it has been recognized as a potential support to the measurement of 76 indicators [105].

#### 4.3.3. Methods

In the context of **Decision Making** and MCDM for SDGs, the utility-based AHP (Analytic Hierarchy Process) turned out to be the most used method, followed by TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), DEMATEL (Decision making trial and evaluation laboratory), PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations), VIKOR (Vlsekriterijumska Optimizacija I KOmpromisno Resenje), ANP (Analytic Network Process), ELECTRE (Elimination and choice translating reality), COPRAS (Complex Proportional Assessment), etc. [143]. Hybrid approaches (such as AHP-TOPSIS and DEMATEL-ANP) are also popular, as well as a combination of MCDM and non-MCDM methods (SWOT analysis, Delphi method, GIS—Geographical Information Systems, multi-stakeholder approaches, participatory techniques, and AI—Artificial Intelligence algorithms). ICT (Information and Communication Technologies), communication technologies, and social media could provide alternative platforms for enhancing engagement [82]. Interviews, collective dialogue sessions, focus groups, workshops, and discussions with groups of experts are among the main collaborative approaches [83]. Reference [60] used the focus group technique for analyzing drivers and barriers toward investment in the energy efficiency measure. Online questionnaires were often used to reach domain experts [61,106,138]. MCDMs were investigated to identify the most relevant quality of life indicators that can be captured by remote sensing, then an AHP was performed [58]. The Combined Compromise Solution (CoCoSo) method was used [107] in combination with Shannon Entropy to assess progress toward SDGs in the EU. Results were confirmed by applying WASPAS and SAW as well. The DEA (Data Envelopment Analysis) approach allowed [147] to assess the role of human capital and technology in achieving SDGs through a carbon-free energy system. A parallel DEA model was used to assess the efficiency of each part of the water-energy-food system and its overall efficiency [148]. The Delphi method allows arriving at a group opinion or decision by surveying a panel of experts, when empirical data is lacking, to support consensus and aggregate large amounts of information [81]. It was used in [149] to weigh the Eurostat indicators for SDG 7 in the EU.

In the **Ecosystem Services** domain, a Delphi-survey among experts was used by [75] to derive a cumulative sustainability index for ES assessment in the main Alpine valleys. Reference [62] set a method by which each target of SDG 2, 6, and 7 was analyzed for its input requirements, infrastructure needs, and risks/benefits for the provision of ES.

In the **Education and Culture** domain, DEA was used by [108] to assess the efficiency of European universities in achieving SDGs.

Several evaluation approaches exist for Health Impact Assessment in the perspective of SDG **Urban Localization**: the Health Economic Assessment Tool (HEAT) for walking and cycling, the Integrated Transport and Health Impact Modelling (ITHIM), the Transportation, Air pollution and Physical Activities (TAPAS), the Urban and Transport Planning Health Impact Assessment (UTOPHIA), or the Blue Active Tool [79]. SWOT analysis was used by [150] to evaluate a refurbishment project in Bologna, Italy. Co-design was found to be a promising tool to address discrepancies between SDG theoretical/conceptual frameworks and their implementation to support urban transformations for SDG Urban Localization [151]. A workshop with seven strategic planners was also held in Östergötland Region, Sweden to identify how the officials' management tasks could be related to the SDGs and detect potential challenges to their implementation [63].

As for **Interlinkage Assessment and Prioritization**, cross-impact analysis among targets to detect trade-offs and positive interlinkages is required to help decision makers take the best decision, rather than finding "optimal solutions" [81]. Relationships among SDG targets "can be analyzed using a variety of tools such as LCA, material flow analysis, input-output analysis, multi-sectoral system analysis, integrated assessment models and general linear model statistical analyses" [64] (p. 6). EFA (Explanatory Factor Analysis) was used to assess the connections between each SDG and the three pillars of the SD [109].

As for **Progress Assessment**, PCA (Principal Component Analysis) was used to compute the score for the achievement of SDGs with multiple indicators [109]. In [149] they used cluster analysis to assess progress against SDG 7 in the EU-27, a method of multivariate comparative analysis allowing for comparison between objects in selected attributes and setting groups with an object having similar characteristics. Usual approaches for cluster analysis are K-means, nearest neighbor, median, center of gravity, and Ward methods. A combinatorial approach between DEA and AutoML (Automated Machine Learning) was used for the attainment prediction of SDGs at a country level [110]. In [152] the authors used DEA to assess the efficiency in meeting SDGs in 2019 for all countries. Nine thematic workshops were held, involving 89 Ministry officials, to discuss the prioritization of SDG targets and detect factors of success and limitation of mainstreaming the 2030 Agenda in a Spanish context [111].

In **Other** domains, spatial and statistical data could be analyzed with multiple regression, to investigate which explanatory variable best describes the dependent variable, thus determining a trend. X-STATIS, belonging to the STATIS family of methods, is useful for getting relevant information from a three-way table by constructing a commitment matrix that summarizes the information [153]. SWOT was employed by [154] for assessing how AI can contribute to SDGs.

#### 4.3.4. Measurements

In the **Governance** domain, according to [73], participation is the governance variable with the most significant positive relations to achieving SDGs, while policy coherence was found to be fundamental in achieving SDGs 15 and 17.

In the **Ecosystem Services** domain, Reference [61] found that 16 ES could vitally contribute to 41 targets from 12 SDGs. Reference [155] found that ES benefit all SDGs directly or indirectly, highlighting their role in preventing possible future pandemics. Reference [106] found that SDGs 1, 2, 3, 5, and 8 were the most ES-related goals, with

SDGs 17, 9, 8, and 5 showing few linkages. ES' role in the Alps region was assessed by [75], revealing that natural, mountainous regions are hotspots of ES supply, whereas high demand is mostly associated with urban areas and intensively used agricultural areas. Besides targeted climate mitigation policies, a direct implementation of the SDGs into policy frameworks was found to allow a more rapid cut in $CO_2$ emissions [156]. According to [157], productivity growth and $CO_2$ emissions have a U-shaped relationship, with growth reaching a minimum point and then starting to increase again while $CO_2$ emissions are rising. The impact of agroforestry was found to be stronger mostly against SDGs 2, 11, 13, and 15 [112].

In the **Education and Culture** domain, SDG integration in educational programs and research was found to be central to shaping future minds and fostering a culture for SD [65]. According to [113], the education-$CO_2$ emission patterns and economic growth-$CO_2$ emission patterns have an inverted U-shaped relationship for OECD countries: with the rise of education, awareness, technological innovation, and economic growth, $CO_2$ emissions decrease. Only a few European universities are already efficient in meeting SDGs, with major gaps in SDG 17 [108], although research might benefit all SDGs [65].

As for SDG **Urban Localization**, it was demonstrated how the energy demand in Germany could be reduced by about 1/3 of to the annual average consumption by designing a reference building powered by photovoltaic panels [114]. Reference [158] demonstrated that the energy mix and the use of alternative energy sources, biomass in particular, is highly compatible with SD policies in the EU-28 and Poland.

As for **Interlinkage Assessment and Prioritization**, reference [66] mapped synergies and trade-offs between energy-related issues and SDGs, highlighting complex links between energy systems and well-being, infrastructure, and the environment. In [106], SDGs 1, 2, and 6 were considered priorities in all macro-globally, while SDGs 8, 9, and 17 were considered less urgent both globally and in Europe. In [159] they identified 33 priority targets by their political feasibility and stakeholder perceptions to cluster them into determinant, critical, regulator, relay, autonomous, and resultant targets. Implementing emission-reduction objectives could further imply some trade-offs in poverty reduction, with countries proposing more ambitious targets being more penalized than others [84], thus slowing down the achievement of SDG 1.

As for **Progress Assessment**, EU-27 countries have been assessed against SDGs based on 17 selected indicators in [107] from 2015–2018. Reference [160] compared the achievement status of SDGs in Western and Eastern European countries. A positive trend of 58 Spanish cities towards SDG 11 was assessed by [153]. Reference [149] investigated SDG 7 achievement in the EU-27. Reference [109] demonstrated that the social and environmental pillars of SD affect the most the achievement of the SDGs in developed countries.

As for **Financial Issues**, reference [85] assessed the costs and characteristics of the global pathway toward both the Paris Agreement and SDG 6. Still, for SDG 6, in [67] they revised targets 6.a and 6.b and their indicators, thus suggesting consistent investment for achieving the goal, as well as the disaggregation between financial and capacity-building assistance by states. Almost 25% of all budgetary programs have been found to have an impact on SDGs in the Spanish case, in particular for SDGs 1, 4, 7, 8, and 16 [115].

In **Other** domains, reference [161] linked 55 bioeconomy impact categories to at least one SDG indicator. In particular, SDG 12 was found to strongly benefit from bioeconomy development. The Sharing Economy was found to insignificantly contribute to SDGs [162]. Reference [14] found that the horizontal accountability for SDG implementation in national government mechanisms is still limited by assessing 2016–2019 VNRs. Reference [68] compared EU countries and the US's, China's, and Russia's performances against the SDGs based on the SDG Index 2017 and sustainability strategies.

#### 4.3.5. Models

As for models to assess **Circular Economy**, reference [135] mentioned Circulytics® by the Ellen MacArthur Foundation, Cradle to Cradle Certified® by Cradle-to-Cradle Products

Innovation Institute, Evaluation of Regional Circular Economy based on Matter Element Analysis, and IFIXIT.

As for the **Ecosystem Services**, 23 modeling tools were found to support the analysis of ES' role against the SDGs, with just a few of them being able to assess trade-offs between multiple ES, but none able to assess them all [61]. Reference [85] used the MESSAGEix-GLOBIOM Integrated Assessment Model to assess integrated water-energy-land systems transformation and estimate the costs and characteristics of the global pathway toward SDG 6. The DPSIR (Driver–Pressure–State–Impact–Response) model, developed by OECD, was employed to measure the achievement of SDG 6 [163].

The System Dynamics-based family of models was mentioned by [69] for comparing and choosing among competing sustainability initiatives, as well as GMADM, a Graphical Multi-Agent **Decision-Making** model.

In the field of SDG **Urban Localization**, a rapid-modeling approach for assessing urban bioclimatic conditions was developed by [164] to carry out fine-scale simulations. Reference [86] employed ENVI-met, a Computational Fluid Dynamic model for assessing environmental quality in a public space. A dasymetric mapping technique was used to disaggregate census data into smaller spatial units with a greater consistency of variable actual distribution, rather than using artificially imposed limits (such as administrative boundaries) [165]. Reference [140] reported on CA-MC, SLEUTH, and ANN as the most suitable models for urban growth simulation and prediction. Autodesk REVIT, a BIM (Building Information Modeling) software, was used by [114] to model a scenario for new building construction as a way to face SDGs 7, 9, and 11.

In the **Progress Assessment** domain, in [74] they cited several forecasting models. Among these, there are IMAGE, MESSAGE-GLOBIOM, GCAM4, REMIND-MAgPIE, and WITCH-GLOBIOM. In [87,88] the authors cited Auto-Regressive Moving Average (ARMA), Auto-Regressive Integrated Moving Average (ARIMA), and Facebook Prophet models as suitable to solving time-series forecasting problems in an SDG attainment prediction assessment perspective.

In **Financial Issues**, in [84] they used a recursive-dynamic Computable General Equilibrium (CGE) model, mimicking the functioning of the world economy and encompassing SDG indicators, to assess both climate mitigation costs and benefits to poverty and inequality reduction.

In **Other** domains, in [147] they employed the QARDL (Quantile Autoregressive Distributive Lag) econometric model to test the stability of the relationship between human capital, technological innovation, energy, and environmental pollution, and SDGs. A Structural Equation Model (SEM) was used to highlight which of the underlying SD pillars is the most effective for achieving SDGs in all countries [109].

#### 4.3.6. Tools

Most suitable Digital Technologies (DTs) for achieving the SDGs were clustered by [144] in agriculture and food production (remote sensing and GIS, APP-based agricultural services, precision agriculture, robotics, AI, genomics, bioinformatics, and Big Data); clean water for all (AI, data and water quality sensing); energy challenges (renewable energy sources management, smart grid integration, and energy efficiency); industry and social well-being (Industry 4.0 for sustainable manufacturing and e-Health technologies); and climate research (global biodiversity assessment, ecological monitoring, and Digital Earth observation data). Specifically, ICT may boost the nexus between water and food systems in urban agriculture practices [166], while AI may directly support the achievement of 45 SDG targets [167]. Many DTs may cooperate with AI in the SDG attainment [89], such as Internet of Things (IoT), 3D technologies, blockchain, 5G communication infrastructure, Big Data, Digital Twin, Smart Territories for urban and rural data management, and emerging technologies (e.g., quantum computing, driver-less cars, etc.) [154]. Specifically, Big Data is a potential catalyst for all SDGs [116,168]. In the eHealth domain, in [53] they focused on the role of Assistive Products as a means to reduce inequalities and leave no one behind.

Disruptive technology and Industry 4.0 might massively benefit the achievement of SDG 9 according to [117].

Adopting blockchain technology may secure IoT applications for SDG achievement [169], which may in turn boost the **Circular Economy** "through informed decision making across sectors such as electrical and electronic wastes" [168] (p. 5). CPSs (Cyber-Physical Systems) are key aspects of Industry 4.0 and CE. In [135] they identified six components to fully develop CPSs: sensors; actuators; power supply; analog and digital hardware components; networks; and microprocessors for software execution. Eighteen CPSs have been further identified as means of implementing SDGs in the different stages of CE.

In the **Ecosystem Services** domain, clean and green technologies are broadly defined as technologies to protect the environment and conserve resources [170], seeking to preserve, track, and reduce the harmful effect of technology on the environment [147]. Nature-Based Solutions (NBS) were mentioned as possible strategies to avoid future pandemics by coupling ES and socio-economic development, thus minimizing trade-offs, promoting synergies, and addressing multidimensional development issues to foster the SDGs [155]. The role of Carbon Capture Technologies has been discussed in [184] (pre-combustion, post-combustion, oxyfuel combustion technologies).

In the **Urban Localization** domain, they identified construction technological solutions providing increased energy efficiency in residential buildings in [70]. Interactive graphical tools may support collaborative investigation and design for achieving SDGs too, as in the case of MetaMAP, an instrument to design initiatives for localizing the 2030 Agenda [69]. In [171] they used Vehicle Routing Problem (VRP) and Capacitated Vehicle Routing Problem (CVRP) algorithms, in combination with Google Maps for visualization, to optimize urban waste management in a Norwegian municipality to assist waste-related SDGs. Spatial data are crucial tools for localizing all SDGs [118] and measuring progress against them. They should be FAIR (Findable, Accessible, Interoperable, and Reusable) for sharing knowledge among communities [90]. Quantum GIS (Q-GIS) is the most used open-source software for spatial analysis. It was used by [165] to monitor SDG 11 in Bari municipality, Italy at an intra-urban scale. They found joining the 1-arcsec Shuttle Radar Topography Mission (SRTM30) and the Advanced Land Observing Satellite (ALOS) World 3D–30 m to be a reliable DEM (Digital Elevation Model) data source for estimating the vertical component of built-up areas at a global scale. At an intra-urban scale, the authors used the LiDAR technique (Light Detection and Ranging or Laser Imaging Detection and Ranging) to extract building footprints and volumes, as well as Urban Atlas by Copernicus Land Monitoring Service to provide land cover and use the information for urban areas' building uses. An ideal urban policy database was suggested by [91] to enable real comparative analysis among city SD policies. Copernicus' European Settlement Maps, providing 2.5 m resolution data on built-up areas, and tree cover density were combined by [86] to observe the public space network and support scenario design.

ARC-Gis by ESRI was used by [75] to analyze **Ecosystem Services** in the Alps region.

In the **Progress Assessment** domain, by using time series as nodes of a bottom-up hierarchical classification technique, [88] forecasted whether a geographic area will meet SDGs at a certain time. The R-Studio software with the deaR package was used to assess the Malmquist index by [119] and assess Spanish local governments in the fulfillment of the SDG 6.

As for **Financial Issues**, budget allocation is essential to achieve SDGs [29,52,54,134], and an increasing number of countries are considering integrating SDGs into their budget processes [115]. New financing models, such as donor funds and accounting approaches for projects are needed to shape the course of development on sustainable paths [54]. Among the economic tools supporting the 2030 Agenda, the nation's subsidies (i.e., "a category of economic instruments for environmental policies, alongside other types of economic instruments such as taxes, tradable permits, regulated tariffs, deposit-refund schemes, road pricing") [134] may specifically support CE. In [92] they addressed the need for policies to finance green products as a means to achieve the SDGs, while other scholars [55] reviewed policies and practices for building renovation and adaptive reuse, which in turn is related to the achievement of energy-related SDGs in cities. Subsidies, tax deductions/credits, grants, and low-interest/no-interest loans are the most used financial tools by EU governments for energy efficiency measures. Sustainability report publishing was identified as an enabling factor to starting an organizational change for sustainability in companies [172], avoiding "cherry-picking" among SDGs in financial and non-financial reporting [120].

In **Other** domains, the Global Food Price dataset, assessing the level of sustainability of food choices available in the market to achieve zero hunger, was diagnosed for outlier detection [173]. In climate research, "contemporary earth observation sensors such as multispectral, hyperspectral, microwave, and LiDAR provide high spatial and spectral resolution data utilizing diverse wavelength regions of the electromagnetic spectrum" [144] (pp. 15–16). A massive volume of data is thus produced, and processing such data using LiMES (Live Monitoring of Earth Surface) and XROI (an open-source toolkit facilitating time-series extraction) may help non-experts in remote sensing to derive useful information out of raw data too. Besides official RS imageries, volunteer crowdsourced mapping, especially on the OpenStreetMap project, has become a source for detailed and timely spatial data, referred to as Volunteered Geographic Information [174]. The Global Inventory Monitoring and Modeling System is a robust dataset on the NDVI (Normalized Difference Vegetation Index) worldwide coming from remote sensing, as highlighted in [121]. In this research, they used satellite data captured and digitized by Landsat, Sentinel-2, and MODIS for cropping intensity mapping in eight different case studies. They also used Global Food Security-support Analysis Data, a dataset providing global cropland/non-cropland identification; PALSAR-2/PALSAR Forest/Non-Forest Map provided by JAXA (Japan Aerospace Exploration Agency); Global Surface Water Mapping Layers provided by the JRC and Google, and Global Human Settlement Layers by the JRC, which produce and analyze maps on the global built-up surface, population density, and human settlement thematic maps in order to understand the human presence on the planet.

#### 4.3.7. Indicators

Indicators can be quantitative, semi-quantitative, or qualitative, and they could be derived from a model, tool, or direct measurements [28]. Besides the official indicators provided by the UN for each target, and translated by Eurostat for the specific EU context, research is putting effort into implementing new indicators supporting the mainstreaming of the SDGs.

For instance, in the **Governance** domain, a novel strategic culture indicator was proposed [173] as a more accurate governance indicator, measuring the variety of urban strategic planning processes taking place in a territory over time. The 13 Sustainable Governance Indicators (SGI) by [73] were used to measure different aspects of governance from the SDG perspective.

In the **Ecosystem Services** domain, the 24 indicators presented in [189] were used by [75] and then linked to SDGs to provide an overview of the status of ES in the entire European Alps at the municipal level and inform social and political actors. Water Footprint (WF) assessment could support different stakeholders in achieving SDG 6, moving beyond volumetric measurement toward a more comprehensive view of water exploitation [176]. In [122] they proposed 14 indicators, collected by a literature survey, to assess integrated water management systems under target 6.5. A national blueprint framework with 24 indicators for measuring SDG 6 was set by [123], highlighting the importance of a circular perspective for water management and quantitative policy targets. Reference [121] reconstructed the NDVI time series, detecting the presence of vegetation on the planet and its over-time evolution by using remote sensing techniques. A set of 87 indicators was established by [184] for assessing the role of carbon capture technologies against all SDGs.

In the **Education and Culture** domain, as reported in [145], the University of the Basque Country (UPV/EHU) provides a list of 58 indicators to carry out the SDG monitoring process in universities. A composite indicator, namely the Green Metric Indicator

Contributions Index, was developed by [177] to sum up the percentage contribution to each UI Green Metric Indicator [190] in sustainable campuses. In [93] they selected and weighted 14 indicators to set a composite culture value index.

As for SDG **Urban Localization**, reference [124] reported on KPIs from CESBA-MED for Sustainable Cities and CESBA-Alps for Sustainable Territories. Reference [58] pre-selected 13 indicators from the ISO 37120:2014(E), and "Indicators for city services and Quality Of Life" were set according to their potential to be quantified via remote sensing. The Malmquist Index was used by [119] to measure the evolution of efficiency according to technological changes produced in Spanish cities against SDG 6. The UTCI (Universal Thermal Climate Index) was used by [164] to assess bioclimatic conditions in urban environments, as it was found to be a better representative of local thermal conditions than other indexes, such as Standard Effective Temperature, Humidex, and Physiological Equivalent Temperature. A renovation rate indicator for accurate monitoring in retrofitting the building stock against SDGs 7, 11, and 13 was proposed by [125]. REDS (Spanish Sustainable Development Network), the Spanish branch of SDSN overseeing the monitoring of SDGs at the city level, provided a report on the SDG achievement status in 100 medium-sized municipalities based on 85 indicators [175].

In **Other** domains, scholars critically reviewed SDG 2 wording in targets and indicators, thus proposing a new set of 22 revised indicators for targets 2.1, 2.2, 2.3, 2.4, and 2.5 [94]. The enabling role of ISO (International Organization for Standardization) standards for achieving SDG 2 was highlighted in [126]. A three-dimensional indicator was developed by [162] to measure the influence of the Sharing Economy on SD in its three pillars.

## 5. Discussion

This section summarizes the main findings and gaps based on the descriptive, bibliometric, and content analysis, and in light of previous studies' highlights. The limits of the adopted approach are acknowledged as well.

### *5.1. Major Findings*

The results of this study highlight an exponential increase in the number of articles published in the last two years, in line with what other scholars found on SDGs, although using different search queries and analysis methods [12,15,19].

The results of the scale of investigation analysis reveal that studies at the national scale are the majority and homogeneously distributed over time. From this perspective, one should keep in mind that SDG implementation remains a political issue [13] and mostly in charge of national governments on a voluntary basis, both for what concerns adopting policies to mainstream the Agenda and reporting on progress against it. SDG achievement might depend highly on national priorities [159], and there is certain evidence of mutual learning among governments about policies and sustainable development due to the SDGs [13]. This is also witnessed by the high interest of scholars in setting governance frameworks for mainstreaming the SDGs (Figure 11), in line with what Biermann and colleagues found, although they also highlighted how there is limited empirical evidence on how this may contribute to the actual implementation of the 2030 Agenda yet. We derive that further research is urgently needed in this field. The results also suggest that research at urban and intra-urban scales is gaining momentum. More than 70% of papers related to cities have been published in 2020–2021 (over 90% have been published after 2019). As for the intra-urban scale, no research was published before 2020 and 60% of papers were published in 2021. From this perspective, scholars should bear in mind that cities are major hotspots for SD, and there is evidence that sub-national authorities, cities in particular, are more pioneering than central governments in committing to the SDGs [13,191,192].

This might further support what emerged in the content analysis: methods, tools, and indicators for actual SDG implementation are mostly meant to operationalize the 2030 Agenda in cities. Vice-versa, cities may constitute the most suitable scale at which to develop and test such tools and methods. Since almost 65% of the 2030 Agenda targets could not be reached without the actual contributions of cities [193], and the urban scale is where the effects of certain policies are more directly experienced by citizens [127,194,195], research is focusing more and more on cities. Specifically, many retrieved indicators are proposed by scholars for the urban scale. Indeed, global indicators may sacrifice local validity and the ability to motivate action by reflecting local values [95]. As for tools, spatial data are nowadays largely available and constitute the main tool for localizing SDGs. Remote sensing and spatial analysis techniques are developing fast, but data availability and resolution at urban and intra-urban scales are far from being as robust as for national or regional scales [196]. However, major challenges lay in acquiring data at an urban and intra-urban scale and spatializing them, particularly data related to the social domain. To remedy this, GIS represents a robust approach to spatialize SDG-related issues, highlighting spatial distributions and patterns, while LiDAR and "lighter" acquiring techniques might help in acquiring intra-urban scale data. Among them, thermal sensing, mobile mapping, Citizen Science, and "humans as sensors" approaches [96] could represent a way of sensitizing people toward a more pro-environmental attitude, as well as overcoming data scarcity in certain contexts. Spatial data and GIS may still definitely assist spatial decision support systems too, which are gaining more and more attention from scholars worldwide. Specifically, AHP, AHN, and PROMETHEE decision-making methods were found to be among the most suitable ones for facing the complexity of urban and territorial transformations under the 2030 Agenda. Research focusing on SDG Urban Localization is most frequently adopting participatory methods for community engagement, stakeholder involvement, and innovative public procurement [97], highlighting the importance of community-led initiatives [178]. We assume that, besides research at the national scale, studies at the urban level are to be further encouraged as well, since they are a testbed to experimenting a wide range of approaches for SD [191]. Apart from urban-scale studies, many papers are dealing with frameworks on the one side, and tools/indicators on the other side, which are the two opposites in the hierarchical classification we adopted. As for tools, research strongly highlights the role of innovation and technology as major enablers of SD in several domains, especially in CE issues and environmental protection. As for indicators, we found emerging efforts in framing and measuring some lacunae present in the official formulations and sets of indicators and goals, e.g., Governance, Ecosystem Services, and Education and Culture. As for the methodologies and related methods, MCDM and decision-support systems constitute the most consolidated field of investigation in the SDG achievement perspective, often applied for involving stakeholders in the participated decision-making process. DEA was frequently used as well, especially for MCDM, interlinkage assessment, and prioritization.

The results of the SDG mapping are now discussed in comparison with what other scholars found about trends in research, although the methods used for this are different and we consider only the EU context. Research on "Affordable and Clean Energy" (SDG 7) seems to be prominent. Decarbonization is imperative, and energy plays a pivotal role in this, as highlighted by the recent war in Ukraine, the energy-related crises, and the Communication on the REPowerEU by the European Commission [197]. As such, energy-related research is recurrent in the SDG perspective, especially on renewables and energy efficiency, mostly at the building and national scale. Great attention by scholars in the EU is devoted to SDG 13 on "Climate Action" too. This strong preference for SDGs 7 and 13 is in line with the considerations of [17] on climate change as a global challenge encompassing energy, sustainable cities, and resilient-ecosystems-related issues. As such, they stay at the core of the European Green Deal policy-related initiatives. Research is strongly supporting the energy transition, which is deeply related to SDG 11 on "Sustainable Communities and Societies" and SDG 9 ("Industry, Innovation and Infrastructure"). Mapping results finally show a major interest of scholars in SDG 12 ("Sustainable Consumption and Production"), SDG 6 ("Clean Water and Sanitation"), SDG 8 ("Decent work and economic growth"), and SDG 15 ("Life on Land") as well. These preferences are partially in line with the findings of [15,17,26,27]. In particular, reference [26] found great interest for SDGs 13, 11, 6, and 15 by scholars in Europe, Asia, and North America based on keyword analysis. The preference for SDG 13 conforms with the study of [15], clustering papers individually, and [17], asking 87 experts from Europe (266 globally) how their research is supporting the SDGs by snowball sampling. In particular, reference [17] highlighted how SDG 12, 11, and 13 received major support from scientific research. Strong preference for SDG 7 occurrences align with [15,27], but is in contrast with [17,26]. The high correspondence among selected papers and SDG 8- and SDG 9-related keywords is in contrast with their findings as well, but in line with the report by [31], relating policy initiatives by the Green Deal and the SDGs via the SDG Mapper Tool. SDG 15 is considered a priority in research according to [15,26]. Expectedly, the mapping of the targets reflects most recurrent issues at the goal level (SDGs 7, 11, 12, 8, and 6), although keywords related to SDG 13 are not linked to specific targets, but rather to generic climate-related issues at the goal level.

Finally, some insights could be derived from the keyword co-occurrence analysis, highlighting consolidated relations within the green cluster (mostly on the environment). Strong inter-cluster connections are visible among the turquoise, yellow, and red clusters (e.g., "GIS"–"Spatial Data"–"Remote Sensing"–"Indicators"–"Implementation"–"Paris Agreement"), as well as red, purple, and blue ones (e.g., "Circular Economy"–"Industry 4.0"–"Innovation"–"COVID-19"–"Climate Change"). "COVID-19" has direct links with "Sustainable development" (green cluster) and "Sustainable Development Goals" only, but research on the impacts of the pandemic on the 2030 Agenda's objectives is reasonably still at an infant stage. Apart from a direct link with "Sustainable Development Goals", "Region" has no further connections, while the "Urban" keyword has only one connection with "Spatial Planning". This may constitute promising fields of further studies, proving the need for cross-scale studies. More research on the links between GIS, Spatial data and digitalization (turquoise), environmental management (green), and governance (blue) could be further encouraged, as well as economic growth (grey) and sustainable development (green) for decoupling the economy from its environmental spillovers. However, this does not mean that other studies have not already been investigating these relationships in the EU context, but that they are not explicitly linked to the SDGs. As for the overlay visualization, national-scale papers are the earliest research, as well as "Paris Agreement", "Climate change", and "Circular Economy" confirming to be among the most solid fields. "Urban", "GIS", "Spatial Data, and "Spatial Planning" keywords mostly appear after 2020, as well as "Implementation", "Indicators", and "Remote Sensing". Latest emerging research relates to the impact of "COVID-19" on the 2030 Agenda, as well as the role of "Construction Industry" and "Innovation" ("Artificial Intelligence", "Industry 4.0", "Digitalization") on the SDG achievement.

### *5.2. Literature Gaps*

Starting with the SDG mapping results, certain main gaps emerge. Some SDGs have been receiving little attention so far. However, this does not mean there is no research supporting them, but rather that existing research in these areas does not necessarily refer to the goals by addressing the SDGs in its title, abstract, or keywords [15]. For instance, in clear contrast with what [19,26,27] found, health and well-being-related issues (SDG 3) have been investigated little so far, in line with [17] (focusing on the European context) and [15]. Indeed, SDG 3 is the goal for which major discrepancies in previous studies could be reported. However, due to time constraints, our findings do not fully take into consideration research investigating the effects of COVID-19, which is rising [128] and has affected mostly SDGs 1, 2, 3, 4, 5, 8, 10, and 16 [179]. Research should pursue addressing explicitly SDG 3, its interlinkages with other goals, and the effects of the pandemic in slowing down the pathway towards the achievement of the SDGs [36] to finally foster new solutions. Furthermore, the link between environmental threats and human health might deserve more interests [198]. Research at sub-national levels could be specifically recommended too, given the pivotal role of local governments in attaining SDG 3and major providers of services closest to people [199]. Mental well-being as a means to enable the

2030 Agenda was not retrieved. Further investigations into this might be recommended as well. Finally, little research is paying attention to SDGs 1, 4, 5, 10, 14, 16, and 17. The scarce consideration of SDGs 5, 14, 16 and 17 matches with the findings of [15,17] for the European context, proving that these areas deserve more attention in research. The analysis at the target level further confirms this, as the targets with no occurrences mostly come from SDGs 1, 10, 14, 16, and 17. As claimed by several authors, data on social and strictly context-dependent phenomena are notably poor. Targeted data acquisition campaigns and coherent policies for solidarity and social economy should be supported [129]. On the contrary, findings on SDG 4 are in contrast with almost all previous studies. However, we argue that in our case, many selected papers are dealing with quality education and the role of universities against the SDGs. We interpret this scarce correspondence by saying that SDG 4-related keywords in the tool might only strictly count education-related papers. However, this might further push the need for stronger evidence on how all SDGs benefit from SDG 4. As evidence, culture plays a crucial role in attaining all SDGs [93], especially for all targets of SDGs 1, 5, 6, and 9 [180]. The lack of a specific SDG for culture and its fragmented presence in only four targets (4.7, 8.9, 11.4, 12.b) might explain why many scholars are dealing with developing indicators in this field and should further encourage new knowledge on this relationship. Finally, the environmental SDGs do not even achieve a balance among themselves. From our results, we assumed that academic research has prioritized action for energy (SDG 7), climate (SDG 13), and water (SDG 6), in line with [19]. However, a few papers focused on the importance of ensuring a proper energy mix [130,158], which emerged after the war crisis in particular. Moreover, although highly mapped, significant WASH-related (Water, Sanitation, and Hygiene) knowledge gaps exist according to [181]. For instance, poor progress and comparable spatial data worldwide on SDG 6 were highlighted by [71]. This may justify the great interest of scholars in SDG 6, in line with major findings by previous research. To fill this gap, tools such as Citizen Science and Earth Observation were suggested for producing reliable knowledge [200] and in situ data at the national or sub-national level [54]. We argue that new research should be developed on life under the sea (SDG 14) too. Although highly mapped, we mention that SDG 12 should still receive major attention, as it is related to decoupling and resource conservation. Indeed, even in countries performing best, the decoupling paradigm is far from being even only addressed by EU Member States, and no sign of structural decoupling between economic growth and environmental spillovers is embodied in EU consumption patterns [36]. CE is one of the key enablers of the 2030 Agenda but still tremendously difficult to operationalize. Many frameworks were settled in this domain, but only in one research [135] existing modeling tools against CE were mentioned, and most surprisingly, no paper proposed indicators or proper methodologies to measure progress in CE specifically from the SDG perspective. One of the main barriers to this could partially lie on (or is reflected in) the wording of SDG 12, one of the most positively interrelated Goals but the with some "uncountable" words (e.g., 'encourage'), with only target 12.3 setting thresholds [72]. From this perspective, just one selected paper focused on the role of the construction industry for CE and SDGs, although it is responsible for over 35% of the EU's total waste generation [201]. However, the construction industry was found to be of primary importance for achieving all SDGs (in order, primarily SDGs 11, 13, 6, 12, and 9) [182]. In this field, research for knowledge creation, joint learning, technology transfer, and innovations is crucial for supporting collaboration among medium and small enterprises for SD and industrial clusters [131].

As for the scale of implementation analysis, besides challenges laying in big cities, small villages are facing depopulation all across the EU, but only two papers investigated the rural scale. As the ALMIA project in Almatret, Spain demonstrated, by involving inhabitants, enhancing the leadership of local administration, and creating a network supporting the transformation, small towns are testbeds for climate neutrality solutions, thus creating value and attractiveness and supporting the achievement of several SDGs as well [183].

As for the approach detected, LCA, although being an internationally standardized methodology and supposed to assess the potential environmental impact of products currently available [202], was not found to be specifically used against SDGs matching our search string. This constitutes a major gap, which some recent studies are contributing to overcome, including [203–205]. Furthermore, priority setting and interlinkage assessment, put together as a research domain, represent the least investigated domain among the ones highlighted. This constitutes a final major gap. Our Conclusions (Section 6) further speculate on this.

### 5.3. Study Limitations

This study faces several limitations. First, although we put efforts to be inclusive when designing the search string, this SLR does not pretend to be fully exhaustive. Other approaches may have been set or employed for SD purposes, not necessarily or explicitly linked to the SDG framework. Indeed, we only focused on articles explicitly addressing the achieving of the SDGs in an EU context and, with other queries, further relevant research items could have emerged [26]. This constitutes the main limitation of this paper. However, this study also wants to reiterate the centrality of the 2030 Agenda for SD, as the SDGs constitute the most comprehensive framework available to conduct research for social, economic, and environmental sustainability [12]. Second, Scopus and WoS statistics are frequently updated, resulting in fluctuations in the number of articles they include [206]. Consequently, the reliability of the information obtained from the databases on any single day is doubtful. Third, we used VOSviewer 1.6.17 for brief bibliometric analysis based on keyword co-occurrence, which has its own set of constraints, and certain publications may be underrepresented in bibliometric records [207]. Fourth, the use of the SDG Mapper tool for detecting correspondence between papers and 2030 Agenda-related keywords might be considered a more robust approach than snowball sampling or individual judgments approaches, as it minimizes biases linked to personal perception and can give a nuanced picture of more than a few goals, based on papers' full length. Moreover, it detects matching with targets too, for more in-depth analysis. Although it represents a robust way to highlight correspondence between a document and the 2030 Agenda, this relation can be misleading, as it might not capture the context in which certain topics are addressed, and it would require more qualitative and expert judgment analysis to complement the automated steps of the semantic mapping process [31]. Moreover, certain goals and targets may address vague concepts difficult to capture through a semantic keyword-matching process (e.g., 17.14 on "enhancing policy coherence for sustainable development"). Finally, the comparison between our results and previous research on the most and least detected SDGs might be misleading to a certain extent, as the number of papers we selected is more limited in certain cases and we focused only on the EU context.

## 6. Conclusions and Recommendations for Future Research

Research is meant to provide great assistance to reaching the objectives set out by the 2030 Agenda in 2015, both for measuring progress and developing new approaches to operationalize it. Although we already are halfway to 2030, major challenges to achieve the SDGs exist according to several ranking methods, as well as research gaps that still emerged from this and previous studies. Progress by researching emerging issues and global environmental threats, and highlighting major gaps could further urge policymakers to finally face them. This paper specifically aimed to systematize knowledge on the role of scientific research in accomplishing the 2030 Agenda as a whole in the EU. This type of study, contextualized, seeking to make assessment mechanisms emerge, systematizing the literature regarding transdisciplinary topics, and looking for the contribution of research for the actual operationalization of the SDGs, was claimed to be highly needed. From this perspective, we argue that if SDGs have to be met and research should play a pivotal role in this, all new studies should be associated with the SDGs [15]. By doing so, research efforts would complementarily focus on achieving the 2030 Agenda, facilitate knowledge sharing, and support progress towards the goals, as several authors already pointed out. This is particularly true for certain SDGs, such as SDG 3. Indeed, we cannot assume that health research is poor, but rather what is lacking is how this might benefit the achievement of the 2030 Agenda's health and well-being goal, and how it relates to other objectives.

Research on the SDG's operationalization in the EU is growing fast, and vice-versa, the 2030 Agenda has been reinvigorating studies on sustainable development. Grounded on this paper's findings, we sum up additional takeaway points for supporting future research in this field:

- In-depth knowledge systematization is further needed to make trends and gaps emerge, going beyond bibliometric studies and focusing on specific contexts;
- Poor intra-cluster links emerged from the bibliometric analysis and most papers are dealing with specific aspects of SDG. This calls for more interdisciplinary and transdisciplinary research;
- Major streams of research are energy (SDG 7), climate action (SDG 13), water (SDG 6), consumption and production pattern (SDG 12), cities (SDG 11) (with a recently growing trend to be further encouraged), and life on land (SDG 15). As such, the SDGs that are directly connected to people's daily lives catch more researchers' attention [27], as well as those more linked to environmental issues [19];
- An imbalance among the SDGs was observed, and the main gaps imply more research is needed on reduced inequalities (SDG 10), gender equality (SDG 5), and peace, justice, and strong institutions (SDG 16); as for the social domain, oceans, seas, and marine environment (SDG 14); as for the environmental domain, partnership for the goals (SDG 17) and cross-scale governance as a major enabler of the Agenda;
- As for SDG 4, more effort in acknowledging and quantifying the contribution of education and culture to the achievement of the 2030 Agenda is still needed. Universities play a primary role in supporting the goals, but academic research and structures should accelerate action to deliver on their contribution to SDGs [187];
- Approaches for achieving the SDGs are heterogeneous and mainly regard different sustainability domains and scales of investigation. As for the sub-national scale, trends in the use of spatial data emerged against all the SDGs, to be further encouraged in combination with new lighter data-acquiring techniques, to make patterns evident and fulfill data scarcity in certain contexts. Frameworks in support of governance and circular economy are available, but models, tools, and indicators to assess them against the SDGs are scarce;
- Certain imbalances are still visible among most mapped SDGs. Thus, given their role in supporting the European Green Deal and sustainable transition policies, further research on SDG 13, SDG 12, and SDG 7, as well as on the profound interconnections between these and the other goals is urgently needed;
- To expand on this, LCA might potentially support EU policies and the achievement of the SDGs through quantitative metrics, but efforts in this area have just been born. Further research should fulfill this gap, from the EU to the urban scale;
- Comprehensive studies operationalizing the SDGs by setting priorities and assessing interlinkages among goals, targets, and scales of implementation are still poor.

These three latest assumptions, in particular, allow us to introduce a couple of extra reflections that might deserve further attention, since priority setting and interlinkage assessment constitutes the core of the 2030 Agenda and could not be neglected.

First, research for operationalizing the 2030 Agenda should assist setting priorities (at goal and target levels) in support of policymaking for specific contexts. As pointed out by previous research, there is no implementation without prioritization and, if all 169 targets are a top priority, there is no priority at all [109]. A proper basket of priorities has been already established by the EU with the Green Deal to a certain extent (SDGs 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15) [208]. However, this constitutes a starting reference. Priorities should ideally be identified by each member state at both goal and target levels, and as shown in different contexts, the research could assist this [159]. Furthermore, we suggest research to foster a cross-scale approach up to the urban level, within a clear governance structure and stakeholders involved in progress measurement, priority setting, and interlinkage assessment processes time after time. As a consequence, once national priority baskets have been defined, research should provide actual support to local authorities to adopt evidence-based regional and urban policies in response to them, eventually by co-identifying local sub-priorities to make sure to 'leave no one behind'. However, despite local specificities, certain issues such as environmental preservation and economic decoupling constitute global major concerns and thus represent a horizontal (across member states and branches of government), vertical (between levels of government) and temporal crosscutting priority [209]. Scholars should primarily address them in light of context specificities.

Second, research should assess contextualized interlinkages, i.e., impacts on the 2030 Agenda as a whole, even when focusing on specific fields. There is evidence for the EU that synergies and trade-offs are not correlated to each other; facing synergies might imply a slight accelerating effect, while not facing trade-offs among policies is slowing down the pathway towards the SDGs, also in EU countries performing best [4]. However, sustainability policies tend to focus on positive interactions and do not consider trade-offs [81]. To overcome this barrier, experts' judgment and collaborations with researchers, academics, policymakers, and other stakeholders should be pursued [6], and could be supported by the use of the seven-point scale introduced by [210]. In addition, more recent and interactive tools might be of help, such as the JRC "SDG Interlinkages" (https://knowsdgs.jrc.ec.europa.eu/, accessed on 6 June 2022). Based on scientific and grey literature review, it might initiate the conversation on interlinkages and Policy Coherence. Indeed, it helps to visualize synergies and trade-offs at both goal and target levels, and support policymakers in both overcoming "silo approaches" and identifying interconnections among policy fields.

These changes of paradigm, embracing a system thinking perspective, are both highly ambitious and more resource and time requiring, but urgently needed as they stay at the core of SDG achievement, as well as a precondition for boosting policy coherence all across the EU and at all governance levels.

**Supplementary Materials:** The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su15097055/s1. File S1. PRISMA 2020 Checklist; File S2. PRISMA 2020 flow diagram [211].

**Author Contributions:** M.T.: Methodology, Investigation, Visualization, Data curation, Writing—Original draft preparation, Writing—Reviewing and Editing. P.L., L.M., R.P. and A.S.: Conceptualization, Supervision, Writing- Reviewing and Editing. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Acknowledgments:** This research is part a Collaborative Doctoral Partnership between the Joint Research Centre and Politecnico di Torino. The authors would like to thank Chiara Genta for her valuable feedback to the first draft of this paper. The authors would like to thank Steve Borchardt and Michele Maroni for their valuable support in the use of the SDG Mapper Tool.

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

## Appendix A

**Table A1.** List of the 2030 Agenda Sustainable Development Goals.

| Number | SDG |
|---|---|
| 1 | No poverty—End poverty in all its forms everywhere |
| 2 | Zero hunger—End hunger, achieve food security and improved nutrition and promote sustainable agriculture |
| 3 | Good health and well-being—Ensure healthy lives and promote well-being for all at all ages |
| 4 | Quality education—Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all |
| 5 | Gender equality—Achieve gender equality and empower all women and girls |
| 6 | Clean water and sanitation—Ensure availability and sustainable management of water and sanitation for all |
| 7 | Affordable and clean energy—Ensure access to affordable, reliable, sustainable and modern energy for all |
| 8 | Decent work and economic growth—Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all |
| 9 | Industry, innovation and infrastructure—Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation |
| 10 | Reduced inequalities—Reduce inequality within and among countries |
| 11 | Sustainable cities and communities—Make cities and human settlements inclusive, safe, resilient and sustainable |
| 12 | Responsible production and consumption—Ensure sustainable consumption and production patterns |
| 13 | Climate action—Take urgent action to combat climate change and its impacts |
| 14 | Life below water—Conserve and sustainably use the oceans, seas and marine resources for sustainable development |
| 15 | Life on land—Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss |
| 16 | Peace, justice and strong institutions—Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels |
| 17 | Partnerships—Strengthen the means of implementation and revitalize the global partnership for sustainable development |

**Table A2.** List of targets with more than 200 occurrences (from most detected) (based on the SDG Mapper Tool—see Figure 6).

| Number | Target |
|---|---|
| 7.2 | By 2030, increase substantially the share of renewable energy in the global energy mix |
| 11.3 | By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries |
| 12.5 | By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse |
| 8.1 | Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries |
| 2.1 | By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round |
| 7.3 | By 2030, double the global rate of improvement in energy efficiency |
| 6.3 | By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally |

**Table A2.** *Cont.*

| Number | Target |
|---|---|
| 15.9 | By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts |
| 9.5 | Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending |
| 7.1 | By 2030, ensure universal access to affordable, reliable and modern energy services |
| 15.2 | By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally |
| 8.5 | By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value |
| 13.2 | Integrate climate change measures into national policies, strategies and planning |
| 13.1 | Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries |
| 6.5 | By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate |
| 16.6 | Develop effective, accountable and transparent institutions at all levels |
| 12.4 | By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment |
| 3.d | Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks |

**Table A3.** Search string history in the time interval 2015–2022 (April), for Open Access and English-written papers.

| Search | Keyword Combination | Scopus (*n.* of Papers) |
|---|---|---|
| #1 | TITLE-ABS-KEY (“SGD*” OR “Sustainable Development Goal*” OR “2030 Agenda” OR “Agenda 2030”) | 10,349 |
| #2 | (#1) AND (“method*” OR “approach*”) | 5179 |
| #3 | (#2) AND (“achieve*” OR “attain*” OR “implement*”) | 3250 |
| #4 | TITLE-ABS-KEY (“SGD* achiev*” OR “Sustainable Development Goal* achiev*” OR “2030 Agenda achiev*” OR “SDG* attain*” OR “Sustainable Development Goal* attain*” OR “2030 Agenda attain*” OR “SDG* implement*” OR “Sustainable Development Goal* implement*” OR “2030 Agenda implement*” OR “2030 Agenda reach*” OR “SDG* reach” OR “sustainable development goal* reach”) | 107 |
| #5 | (#4) AND (“approach*”) | 56 |
| #6 | TITLE-ABS-KEY (“SDG* achiev*” OR “Sustainable Development Goal* achiev*” OR “achiev* SDG*” OR “achiev* Sustainable Development Goal*” OR (“Agenda 2030 achiev*” OR “achiev* Agenda 2030” OR “2030 Agenda achiev*” OR “achiev* 2030 Agenda”) | 652 |
| #7 | TITLE-ABS-KEY (“SDG* achiev*” OR “Sustainable Development Goal* achiev*” OR “achiev* SDG*” OR “achiev* Sustainable Development Goal*” OR “achiev* 2030 Agenda” OR “2030 Agenda achiev*” OR “SDG* attain*” OR “attain* SDG*” OR “Sustainable Development Goal* attain*” OR “attain* Sustainable Development Goal*” OR “2030 Agenda attain*” OR “attain Agenda 2030” OR “SDG* implement*” OR “implement* SDG*” OR “implement* Sustainable Development Goal*” OR “Sustainable Development Goal* implement*” OR “2030 Agenda implement*” OR “implement* 2030 Agenda” OR SDG* mainstream*” OR “Sustainable Development Goal* mainstream*” OR “mainstream* SDG*” OR “mainstream* Sustainable Development Goal*” OR “mainstream* 2030 Agenda” OR “2030 Agenda mainstream*” OR “SDG* localiz*” OR “Sustainable Development Goal* localiz*” OR “localiz* SDG*” OR “localiz* Sustainable Development Goal*” OR “localiz* 2030 Agenda” OR “2030 Agenda localiz*”) | 797 |

## References


1. United Nations General Assembly. Transforming Our World: The 2030 Agenda for Sustainable Development. (Resolution Adopted by the General Assembly A/RES/70/1). 21 October 2015. Available online: https://www.refworld.org/docid/57b6e3e44.html (accessed on 16 March 2022).
2. UNSTAT. Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development. A/RES/71/313. 2020. Available online: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202020%20review_Eng.pdf (accessed on 14 April 2022).
3. Lafortune, G.; Fuller, G.; Schmidt-Traub, G.; Kroll, C. How Is Progress towards the Sustainable Development Goals Measured? Comparing Four Approaches for the EU. *Sustainability* **2020**, *12*, 7675. [CrossRef]
4. Kostetckaia, M.; Hametner, M. How Sustainable Development Goals interlinkages influence European Union countries' progress towards the 2030 Agenda. *Sustain. Dev.* **2022**, *30*, 916–926. [CrossRef]
5. Miola, A.; Schiltz, F. Measuring sustainable development goals performance: How to monitor policy action in the 2030 Agenda implementation? *Ecol. Econ.* **2019**, *164*, 106373. [CrossRef] [PubMed]
6. Gusmão Caiado, R.G.; Leal Filho, W.; Quelhas, O.L.G.; Luiz de Mattos Nascimento, D.; Ávila, L.V. A literature-based review on potentials and constraints in the implementation of the sustainable development goals. *J. Clean. Prod.* **2018**, *198*, 1276–1288. [CrossRef]
7. Giupponi, C.; Gain, A.K. Integrated spatial assessment of the water, energy and food dimensions of the Sustainable Development Goals. *Reg. Environ. Chang.* **2017**, *17*, 1881–1893. [CrossRef]
8. Tóthová, D.; Heglasová, M. Measuring the environmental sustainability of 2030 Agenda implementation in EU countries: How do different assessment methods affect results? *J. Environ. Manag.* **2022**, *322*, 116152. [CrossRef]
9. Miola, A.; Borchardt, S.; Neher, F.; Buscaglia, D. *Interlinkages and Policy Coherence for the Sustainable Development Goals Implementation: An Operational Method to Identify Trade-Offs and Co-Benefits in a Systemic Way*; Publications Office of the European Union: Luxembourg, 2019.
10. Pradhan, P.; Costa, L.; Rybski, D.; Lucht, W.; Kropp, J.P. A Systematic Study of Sustainable Development Goal (SDG) Interactions. *Earth's Futur.* **2017**, *5*, 1169–1179. [CrossRef]
11. Biglari, S.; Beiglary, S.; Arthanari, T. Achieving sustainable development goals: Fact or Fiction? *J. Clean. Prod.* **2022**, *332*, 130032. [CrossRef]
12. Díaz-López, C.; Martín-Blanco, C.; De La, J.J.; Bayo, T.; Rubio-Rivera, B.; Zamorano, M.; Blanco, M.; De La, C.; Rubio-Rivera, J.J.; Zamorano, B.; et al. Analyzing the Scientific Evolution of the Sustainable Development Goals. *Appl. Sci.* **2021**, *11*, 8286. [CrossRef]
13. Biermann, F.; Hickmann, T.; Sénit, C.A.; Beisheim, M.; Bernstein, S.; Chasek, P.; Grob, L.; Kim, R.E.; Kotzé, L.J.; Nilsson, M.; et al. Scientific evidence on the political impact of the Sustainable Development Goals. *Nat. Sustain.* **2022**, *5*, 795–800. [CrossRef]
14. Breuer, A.; Leininger, J. Horizontal accountability for SDG implementation: A comparative cross-national analysis of emerging national accountability regimes. *Sustainability* **2021**, *13*, 7002. [CrossRef]
15. Yamaguchi, N.U.; Bernardino, E.G.; Ferreira, M.E.C.; de Lima, B.P.; Pascotini, M.R.; Yamaguchi, M.U. Sustainable development goals: A bibliometric analysis of literature reviews. *Environ. Sci. Pollut. Res.* **2023**, *30*, 5502–5515. [CrossRef]
16. Lim, W.M.; Kumar, S.; Ali, F. Advancing knowledge through literature reviews: 'what', 'why', and 'how to contribute'. *Serv. Ind. J.* **2022**, *42*, 481–513. [CrossRef]
17. Salvia, A.L.; Leal Filho, W.; Brandli, L.L.; Griebeler, J.S. Assessing research trends related to Sustainable Development Goals: Local and global issues. *J. Clean. Prod.* **2019**, *208*, 841–849. [CrossRef]
18. Leal Filho, W.; Azeiteiro, U.; Alves, F.; Pace, P.; Mifsud, M.; Brandli, L.; Caeiro, S.S.; Disterheft, A. Reinvigorating the sustainable development research agenda: Role of sustainable development goals. *Int. J. Sustain. Dev. World Ecol.* **2018**, *25*. [CrossRef]
19. Sianes, A.; Vega-Muñoz, A.; Tirado-Valencia, P.; Ariza-Montes, A. Impact of the Sustainable Development Goals on the academic research agenda. A scientometric analysis. *PLoS ONE* **2022**, *17*, e0265409. [CrossRef]
20. European Commission. SWD/2021/305: Better Regulation Guidelines. 2021. Available online: https://ec.europa.eu/info/sites/default/files/swd2021_305_en.pdf (accessed on 30 September 2022).
21. European Commission. COM/2016/739: Next Steps for a Sustainable Future. European Action for Sustainability. 2016. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2016%3A739%3AFIN (accessed on 16 June 2022).
22. Pizzi, S.; Caputo, A.; Corvino, A.; Venturelli, A. Management research and the UN sustainable development goals (SDGs): A bibliometric investigation and systematic review. *J. Clean. Prod.* **2020**, *276*, 124033. [CrossRef]
23. Yu, Y.; Huang, J. Poverty Reduction of Sustainable Development Goals in the 21st Century: A Bibliometric Analysis. *Front. Commun.* **2021**, *6*, 218. [CrossRef]
24. De Sousa, F.D.B. The role of plastic concerning the sustainable development goals: The literature point of view. *Clean. Responsible Consum.* **2021**, *3*, 100020. [CrossRef]
25. Belmonte-Ureña, L.J.; Plaza-Úbeda, J.A.; Vazquez-Brust, D.; Yakovleva, N. Circular economy, degrowth and green growth as pathways for research on sustainable development goals: A global analysis and future agenda. *Ecol. Econ.* **2021**, *185*, 107050. [CrossRef]
26. Meschede, C. The Sustainable Development Goals in Scientific Literature: A Bibliometric Overview at the Meta-Level. *Sustainability* **2020**, *12*, 4461. [CrossRef]

27. Yeh, S.C.; Hsieh, Y.L.; Yu, H.C.; Tseng, Y.H. The Trends and Content of Research Related to the Sustainable Development Goals: A Systemic Review. *Appl. Sci.* **2022**, *12*, 6820. [CrossRef]
28. Sala, S.; Farioli, F.; Zamagni, A. Progress in sustainability science: Lessons learnt from current methodologies for sustainability assessment: Part 1. *Int. J. Life Cycle Assess.* **2013**, *18*, 1653–1672. [CrossRef]
29. Georgeson, L.; Maslin, M. Putting the United Nations Sustainable Development Goals into practice: A review of implementation, monitoring, and finance. *Geo Geogr. Environ.* **2018**, *5*, e00049. [CrossRef]
30. Romero Goyeneche, O.Y.; Ramirez, M.; Schot, J.; Arroyave, F. Mobilizing the transformative power of research for achieving the Sustainable Development Goals. *Res. Policy* **2022**, *51*, 104589. [CrossRef]
31. Borchardt, S.; Barbero Vignola, G.; Buscaglia, D.; Maroni, M.; Marelli, L. *Mapping EU Policies with the 2030 Agenda and SDGs*; EUR 31347 EN; Publications Office of the European Union: Luxembourg, 2022; ISBN 978-92-76-60474-7. [CrossRef]
32. European Commission. COM/2019/640 The European Green Deal. 2019. Available online: https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf (accessed on 13 May 2022).
33. Schmidt-Traub, G.; Kroll, C.; Teksoz, K.; Durand-Delacre, D.; Sachs, J. National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards. *Nat. Geosci.* **2017**, *10*, 547–555. [CrossRef]
34. SDSN & IEEP. Europe Sustainable Development Report 2021. Transforming the European Union to Achieve the Sustainable Development Goals. 2021. Available online: www.pica-publishing.com (accessed on 15 May 2022).
35. OECD. *The Short and Winding Road to 2030: Measuring Distance to the SDG Targets*; OECD Publishing: Paris, France, 2022. [CrossRef]
36. Eurostat. Sustainable Development in the European Union. Monitoring Report on Progress towards the SDGs in an EU Context. 2022. Available online: https://ec.europa.eu/eurostat/web/products-flagship-publications/-/ks-09-22-019 (accessed on 20 February 2023).
37. ASviS. Measuring the Situation of the European Union with Regard to the SDGs. 2019. Available online: https://asvis.it/public/asvis2/files/Pubblicazioni/Compositi_Europei_ENG_HR.pdf (accessed on 10 January 2022).
38. UNDESA. 2021 Voluntary National Reviews Synthesis Report. 2021. Available online: https://sustainabledevelopment.un.org/content/documents/294382021_VNR_Synthesis_Report.pdf (accessed on 13 June 2022).
39. UNDESA. The Sustainable Development Goals Report. 2021. Available online: https://desapublications.un.org/publications/sustainable-development-goals-report-2021 (accessed on 18 February 2023).
40. UNDESA. Repository of Good Practices in Voluntary National Review (VNR) Reporting. 2021. Available online: https://sustainabledevelopment.un.org/content/documents/29453Repository_of_Good_Practicess_in_VNR_Reporting.pdf (accessed on 15 May 2022).
41. Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.S.; Lambin, E.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.; et al. A safe operating space for humanity. *Nature* **2009**, *461*, 472–475. [CrossRef]
42. Finland Prime Minister's Office. Report on the Implementation of the 2030 Agenda for Sustainable Development. 2020. Available online: https://sustainabledevelopment.un.org/content/documents/26261VNR_Report_Finland_2020.pdf (accessed on 16 May 2021).
43. UN Secretary-General. Voluntary Common Reporting Guidelines for Voluntary National Reviews at the High-Level Political Forum on Sustainable Development (HLPF). 2021. Available online: https://sustainabledevelopment.un.org/vnrs/ (accessed on 17 May 2022).
44. UNDESA. Handbook for the Preparation of Voluntary National Reviews. The 2022 Edition. 2022. Available online: https://sustainabledevelopment.un.org/content/documents/29410VNR_Handbook_2022_English.pdf (accessed on 15 May 2022).
45. Siragusa, A.; Stamos, I.; Bertozzi, C.; Proietti, P. *European Handbook for SDG Voluntary Local Reviews—2022 Edition*; EUR 31111 EN; Publications Office of the European Union: Luxembourg, 2022; ISBN 978-92-76-53390-0. [CrossRef]
46. Siragusa, A.; Vizcaino, M.P.; Proietti, P.; Lavalle, C. *European Handbook for SDG Voluntary Local Reviews*; EUR 30067 EN; Publications Office of the European Union: Luxembourg, 2020; ISBN 978-92-76-15402-0. [CrossRef]
47. Rapun, M.V.; Stamos, I.; Proietti, P.; Siragusa, A. *REGIONS2030–European Regional SDG Indicators*; EUR 31326 EN; Publications Office of the European Union: Luxembourg, 2022; ISBN 978-92-76-59309-6. [CrossRef]
48. Munn, Z.; Peters, M.D.J.; Stern, C.; Tufanaru, C.; McArthur, A.; Aromataris, E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Med. Res. Methodol.* **2018**, *18*, 1–7. [CrossRef]
49. Tranfield, D.; Denyer, D.; Smart, P. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *Br. J. Manag.* **2003**, *14*, 207–222. [CrossRef]
50. Bryman, A. *Social Research Methods*, 5th ed.; Oxford Univrsity Press: Oxford, UK, 2016.
51. Caldeira, C.P.; Farcal, R.; Moretti, C.; Mancini, L.; Rauscher, H.; Rasmussen, K.; Sintes, J.R.; Sala, S. *Safe and Sustainable by Design Chemicals and Materials Review of Safety and Sustainability Dimensions, Aspects, Methods, Indicators, and Tools*; EUR 30991 EN; Publications Office of the European Union: Luxembourg, 2022; ISBN 978-92-76-47560-6. [CrossRef]
52. Meuleman, L.; Niestroy, I. Common but differentiated governance: A metagovernance approach to make the SDGs work. *Sustainability* **2015**, *7*, 12295–12321. [CrossRef]
53. Tebbutt, E.; Brodmann, R.; Borg, J.; MacLachlan, M.; Khasnabis, C.; Horvath, R. Assistive products and the Sustainable Development Goals (SDGs). *Global. Health* **2016**, *12*, 79. [CrossRef] [PubMed]
54. Bhaduri, A.; Bogardi, J.; Siddiqi, A.; Voigt, H.; Vörösmarty, C.; Pahl-Wostl, C.; Bunn, S.E.; Shrivastava, P.; Lawford, R.; Foster, S.; et al. Achieving sustainable development goals from a water perspective. *Front. Environ. Sci.* **2016**, *4*, 64. [CrossRef]

55. Sigmund, Z. Sustainability in architectural heritage: Review of policies and practices. *Organ. Technol. Manag. Constr. Int. J.* **2016**, *8*, 1411–1421. [CrossRef]
56. Pishchulov, G.V.; Richter, K.K.; Pakhomova, N.V.; Tsenzharik, M.K. A circular economy perspective on sustainable supply chain management: An updated survey. *St Petersbg. Univ. J. Econ. Stud.* **2018**, *34*, 267–297. [CrossRef]
57. Bruce, C.; James, H.; Janie, R.; Clare, S.; Stephen, T.; Eva, W. Urgent action to combat climate change and its impacts (SDG 13): Transforming agriculture and food systems. *Curr. Opin. Environ. Sustain.* **2018**, *34*, 13–20. [CrossRef]
58. Lehner, A.; Erlacher, C.; Schlögl, M.; Wegerer, J.; Blaschke, T.; Steinnocher, K. Can ISO-defined urban sustainability indicators be derived from remote sensing: An expert weighting approach. *Sustainability* **2018**, *10*, 1268. [CrossRef]
59. Lim, M.M.L.; Jørgensen, P.S.; Wyborn, C.A. Reframing the sustainable development goals to achieve sustainable development in the anthropocene—A systems approach. *Ecol. Soc.* **2018**, *23*, 22. [CrossRef]
60. Di Foggia, G. Energy efficiency measures in buildings for achieving sustainable development goals. *Helion* **2018**, *4*, e00953. [CrossRef]
61. 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.; et al. Distilling the role of ecosystem services in the Sustainable Development Goals. *Ecosyst. Serv.* **2018**, *29*, 70–82. [CrossRef]
62. Fader, M.; Cranmer, C.; Lawford, R.; Engel-Cox, J. Toward an understanding of synergies and trade-offs between water, energy, and food SDG targets. *Front. Environ. Sci.* **2018**, *6*, 112. [CrossRef]
63. Gustafsson, S.; Ivner, J. Implementing the Global Sustainable Goals (SDGs) into Municipal Strategies Applying an Integrated Approach. In *World Sustainability Series*; Springer: Berlin/Heidelberg, Germany, 2018; pp. 301–316.
64. Liu, J.; Hull, V.; Godfray, H.C.J.; Tilman, D.; Gleick, P.; Hoff, H.; Pahl-Wostl, C.; Xu, Z.; Chung, M.G.; Sun, J.; et al. Nexus approaches to global sustainable development. *Nat. Sustain.* **2018**, *1*, 466–476. [CrossRef]
65. Fayomi, O.S.I.; Okokpujie, I.P.; Udo, M. The Role of Research in Attaining Sustainable Development Goals. *IOP Conf.Ser. Mater. Sci. Eng.* **2018**, *413*, 012002. [CrossRef]
66. Fuso Nerini, F.; Tomei, J.; To, L.S.; Bisaga, I.; Parikh, P.; Black, M.; Borrion, A.; Spataru, C.; Castán Broto, V.; Anandarajah, G.; et al. Mapping synergies and trade-offs between energy and the Sustainable Development Goals. *Nat. Energy* **2018**, *3*, 10–15. [CrossRef]
67. Bartram, J.; Brocklehurst, C.; Bradley, D.; Muller, M.; Evans, B. Policy review of the means of implementation targets and indicators for the sustainable development goal for water and sanitation. *NPJ Clean Water* **2018**, *1*, 3. [CrossRef]
68. Liu, B.; Jiang, X.; Jin, T. Analysis of national strategies for sustainable development with regard to fundamental conceptual premise. *J. Phys. Conf. Serv.* **2018**, *1141*, 01201. [CrossRef]
69. Maher, R.; Maher, M.; Mann, S.; McAlpine, C.A. Integrating design thinking with sustainability science: A Research through Design approach. *Sustain. Sci.* **2018**, *13*, 1565–1587. [CrossRef]
70. Stoikov, V.; Gassiy, V. Energy efficiency of housing as a tool for sustainable development. *MATEC Web Conf.* **2018**, *251*, 03061. [CrossRef]
71. Ortigara, A.R.C.; Kay, M.; Uhlenbrook, S. A review of the SDG 6 synthesis report 2018 from an education, training, and research perspective. *Water* **2018**, *10*, 1353. [CrossRef]
72. Bengtsson, M.; Alfredsson, E.; Cohen, M.; Lorek, S.; Schroeder, P. Transforming systems of consumption and production for achieving the sustainable development goals: Moving beyond efficiency. *Sustain. Sci.* **2018**, *13*, 1533–1547. [CrossRef] [PubMed]
73. Glass, L.M.; Newig, J. Governance for achieving the Sustainable Development Goals: How important are participation, policy coherence, reflexivity, adaptation and democratic institutions? *Earth Syst. Gov.* **2019**, *2*, 100031. [CrossRef]
74. Kostoska, O.; Kocarev, L. A novel ICT framework for sustainable development goals. *Sustainability* **2019**, *11*, 1961. [CrossRef]
75. Schirpke, U.; Vigl, L.E.; Tasser, E.; Tappeiner, U. Analyzing spatial congruencies and mismatches between supply, demand and flow of ecosystem services and sustainable development. *Sustainability* **2019**, *11*, 2227. [CrossRef]
76. Callisto, M.; Solar, R.; Silveira, F.A.O.; Saito, V.S.; Hughes, R.M.; Fernandes, G.W.; Gonçalves-Júnior, J.F.; Leitão, R.P.; Massara, R.L.; Macedo, D.R.; et al. A Humboldtian Approach to Mountain Conservation and Freshwater Ecosystem Services. *Front. Environ.Sci.* **2019**, *7*, 195. [CrossRef]
77. Zu Ermgassen, S.O.S.E.; Utamiputri, P.; Bennun, L.; Edwards, S.; Bull, J.W. The Role of 'No Net Loss' Policies in Conserving Biodiversity Threatened by the Global Infrastructure Boom. *One Earth* **2019**, *1*, 305–315. [CrossRef]
78. Mohanty, S.P.; Ramaswamy, R.; Duraiappah, A.K. On the design of a youth-led, issue-based, crowdsourced global monitoring framework for the SDGs. *Sustainability* **2019**, *11*, 6839. [CrossRef]
79. Ramirez-Rubio, O.; Daher, C.; Fanjul, G.; Gascon, M.; Mueller, N.; Pajín, L.; Plasencia, A.; Rojas-Rueda, D.; Thondoo, M.; Nieuwenhuijsen, M.J. Urban health: An example of a 'health in all policies' A pproach in the context of SDGs implementation. *Global. Health* **2019**, *15*, 1–21. [CrossRef]
80. Krellenberg, K.; Bergsträßer, H.; Bykova, D.; Kress, N.; Tyndall, K. Urban sustainability strategies guided by the SDGs-A tale of four cities. *Sustainability* **2019**, *11*, 1116. [CrossRef]
81. Nilsson, M.; Weitz, N. Governing trade-offs and building coherence in policy-making for the 2030 Agenda. *Politics Gov.* **2019**, *7*, 254–263. [CrossRef]
82. Guha, J.; Chakrabarti, B. Achieving the Sustainable Development Goals (SDGs) through decentralisation and the role of local governments: A systematic review. *Commonw. J. Local Gov.* **2019**, 6855. [CrossRef]

83. Da Silva, L.M.; Bitencourt, C.C.; Faccin, K.; Iakovleva, T. The role of stakeholders in the context of responsible innovation: A meta-synthesis. *Sustainability* **2019**, *11*, 1766. [CrossRef]
84. Campagnolo, L.; Davide, M. Can the Paris deal boost SDGs achievement? An assessment of climate mitigation co-benefits or side-effects on poverty and inequality. *World Dev.* **2019**, *122*, 96–109. [CrossRef]
85. Parkinson, S.; Krey, V.; Huppmann, D.; Kahil, T.; McCollum, D.; Fricko, O.; Byers, E.; Gidden, M.J.; Mayor, B.; Khan, Z.; et al. Balancing clean water-climate change mitigation trade-offs. *Environ. Res. Lett.* **2019**, *14*, 014009. [CrossRef]
86. Vukmirovic, M.; Gavrilovic, S.; Stojanovic, D. The improvement of the comfort of public spaces as a local initiative in coping with climate change. *Sustainability* **2019**, *11*, 6546. [CrossRef]
87. Alharbi, Y.; Arribas-Bel, D.; Coenen, F. Sustainable development goals monitoring and forecasting using time series analysis. In Proceedings of the 2nd International Conference on Deep Learning Theory and Applications DeLTA 2021, Online, 7–9 July 2021; pp. 123–131. [CrossRef]
88. Alharbi, Y.; Arribas-Be, D.; Coenen, F. Sustainable Development Goal Attainment Prediction: A Hierarchical Framework using Time Series Modelling. In Proceedings of the 11th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, Vienna, Austria, 17–19 September 2019; Volume 1, pp. 297–304. [CrossRef]
89. Berawi, M.A. The role of industry 4.0 in achieving Sustainable Development Goals. *Int. J. Technol.* **2019**, *10*, 644–647. [CrossRef]
90. Ivánová, I.; Brown, N.; Fraser, R.; Tengku, N.; Rubinov, E. Fair and standard access to spatial data as the means for achieving sustainable development goals. *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* **2019**, *42*, 33–39. [CrossRef]
91. Rozhenkova, V.; Allmang, S.; Ly, S.; Franken, D.; Heymann, J. The role of comparative city policy data in assessing progress toward the urban SDG targets. *Cities* **2019**, *95*, 102357. [CrossRef]
92. Zhao, L.; Chen, Y. Optimal subsidies for green products: A maximal policy benefit perspective. *Symmetry* **2019**, *11*, 63. [CrossRef]
93. Streimikiene, D.; Mikalauskiene, A.; Kiausiene, I. The impact of value created by culture on approaching the sustainable development goals: Case of the Baltic States. *Sustainability* **2019**, *11*, 6437. [CrossRef]
94. Gil, J.D.B.; Reidsma, P.; Giller, K.; Todman, L.; Whitmore, A.; van Ittersum, M. Sustainable development goal 2: Improved targets and indicators for agriculture and food security. *Ambio* **2019**, *48*, 685–698. [CrossRef]
95. Tan, D.T.; Siri, J.G.; Gong, Y.; Ong, B.; Lim, S.C.; MacGillivray, B.H.; Marsden, T. Systems approaches for localising the SDGs: Co-production of place-based case studies. *Global. Health* **2019**, *15*, 85. [CrossRef]
96. Pricope, N.G.; Mapes, K.L.; Woodward, K.D. Remote sensing of human-environment interactions in global change research: A review of advances, challenges and future directions. *Remote Sensing* **2019**, *11*, 2783. [CrossRef]
97. Hamdan, H.A.M.; De Boer, L. Innovative public procurement (IPP)—Implications and potential for zero-emission neighborhood (ZEN) projects? *IOP Conf. Ser. Earth Environ. Sci.* **2019**, *352*, 012013. [CrossRef]
98. Beyne, J. Designing and Implementing Sustainability: An Integrative Framework for Implementing the Sustainable Development Goals. *Eur. J. Sustain. Dev.* **2020**, *9*, 1. [CrossRef]
99. Jiménez, A.; Saikia, P.; Giné, R.; Avello, P.; Leten, J.; Lymer, B.L.; Schneider, K.; Ward, R. Unpacking water governance: A framework for practitioners. *Water* **2020**, *12*, 827. [CrossRef]
100. Lawrence, R.J. Overcoming Barriers to Implementing Sustainable Development Goals: Human Ecology Matters. *Hum. Ecol. Rev.* **2020**, *26*, 1. [CrossRef]
101. Croce, S.; Vettorato, D. The definition of urban surface uses: A systemic approach for climate resilient and sustainable cities. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *588*, 052035. [CrossRef]
102. Langevin, J.; Reyna, J.L.; Ebrahimigharehbaghi, S.; Sandberg, N.; Fennell, P.; Nägeli, C.; Laverge, J.; Delghust, M.; Mata, É.; Van Hove, M.; et al. Developing a common approach for classifying building stock energy models. *Renew. Sustain. Energy Rev.* **2020**, *133*, 110276. [CrossRef]
103. Stoeglehner, G. Integrated spatial and energy planning: A means to reach sustainable development goals. *Evol. Inst. Econ. Rev.* **2020**, *17*, 473–486. [CrossRef]
104. Palmer, E.; Burton, R.; Haskins, C. A systems engineering framework for bioeconomic transitions in a sustainable development goal context. *Sustainability* **2020**, *12*, 6650. [CrossRef]
105. Fraisl, D.; Campbell, J.; See, L.; Wehn, U.; Wardlaw, J.; Gold, M.; Moorthy, I.; Arias, R.; Piera, J.; Oliver, J.L.; et al. Mapping citizen science contributions to the UN sustainable development goals. *Sustain. Sci.* **2020**, *15*, 1735–1751. [CrossRef]
106. 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]
107. Stanujkic, D.; Popovic, G.; Zavadskas, E.K.; Karabasevic, D.; Binkyte-Veliene, A. Assessment of progress towards achieving sustainable development goals of the 'Agenda 2030' by using the CoCoSo and the shannon entropy methods: The case of the Eu countries. *Sustainability* **2020**, *12*, 5717. [CrossRef]
108. Perović, L.M.; Kosor, M.M. The efficiency of universities in achieving sustainable development goals. *Amfiteatru Econ.* **2020**, *22*, 516–532. [CrossRef]
109. Bali Swain, R.B.; Yang-Wallentin, F. Achieving sustainable development goals: Predicaments and strategies. *Int. J. Sustain. Dev. World Ecol.* **2020**, *27*, 96–106. [CrossRef]
110. Singpai, B.; Wu, D. Using a DEA-AutoML approach to track SDG achievements. *Sustainability* **2020**, *12*, 10124. [CrossRef]

111. Soberón, M.; Sánchez-Chaparro, T.; Urquijo, J.; Pereira, D. Introducing an organizational perspective in sdg implementation in the public sector in Spain: The case of the former ministry of agriculture, fisheries, food and environment. *Sustainability* **2020**, *12*, 9959. [CrossRef]
112. Goparaju, L.; Ahmad, F.; Uddin, M.; Rizvi, J. Agroforestry: An effective multi-dimensional mechanism for achieving sustainable development goals. *Ecol. Quest.* **2020**, *31*, 63–71. [CrossRef]
113. Zafar, M.W.; Shahbaz, M.; Sinha, A.; Sengupta, T.; Qin, Q. How renewable energy consumption contribute to environmental quality? The role of education in OECD countries. *J. Clean. Prod.* **2020**, *268*, 122144. [CrossRef]
114. Couston, C.M.G.; Auda, J.; Caçar, C.; Hwang, J.; Karl, M.M.; Bunschoten, R. Inhabitable Infrastructures: A scenario towards sustainable energy in Berlin. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *588*, 022041. [CrossRef]
115. Sisto, R.; López, J.G.; Quintanilla, A.; de Juanes, Á.; Mendoza, D.; Lumbreras, J.; Mataix, C. Quantitative analysis of the impact of public policies on the sustainable development goals through budget allocation and indicators. *Sustainability* **2020**, *12*, 583. [CrossRef]
116. Danubianu, M. Big data—Catalyst of Sustainable Development. *Present Environ. Sustain. Dev.* **2020**, *14*. [CrossRef]
117. Lekan, A.; Aigbavboa, C.; Babatunde, O.; Olabosipo, F.; Christiana, A. Disruptive technological innovations in construction field and fourth industrial revolution intervention in the achievement of the sustainable development goal 9. *Int. J. Constr. Manag.* **2020**, *22*, 2647–2658. [CrossRef]
118. Avtar, R.; Aggarwal, R.; Kharrazi, A.; Kumar, P.; Kurniawan, T.A. Utilizing geospatial information to implement SDGs and monitor their Progress. *Environ. Monit. Assess.* **2020**, *192*, 35. [CrossRef]
119. Martínez-Córdoba, P.J.; Raimo, N.; Vitolla, F.; Benito, B. Achieving sustainable development goals. Efficiency in the spanish clean water and sanitation sector. *Sustainability* **2020**, *12*, 3015. [CrossRef]
120. Kornieieva, Y.; Kornieieva, Y. Non-financial Reporting Challenges in Monitoring SDG's Achievement: Investment Aspects for Transition Economy. *Int. J. Econ. Bus. Adm.* **2020**, *VIII*, 62–71.
121. Liu, C.; Zhang, Q.; Tao, S.; Qi, J.; Ding, M.; Guan, Q.; Wu, B.; Zhang, M.; Nabil, M.; Tian, F.; et al. A new framework to map fine resolution cropping intensity across the globe: Algorithm, validation, and implication. *Remote Sens. Environ.* **2020**, *251*, 112095. [CrossRef]
122. Benson, D.; Gain, A.K.; Giupponi, C. Moving beyond water centricity? Conceptualizing integrated water resources management for implementing sustainable development goals. *Sustain. Sci.* **2020**, *15*, 671–681. [CrossRef]
123. Essex, B.; Koop, S.H.A.; Van Leeuwen, C.J. Proposal for a National Blueprint Framework to Monitor Progress on Water-Related Sustainable Development Goals in Europe. *Environ. Manag.* **2020**, *65*, 1–18. [CrossRef]
124. Moro, A. Transnational common sustainability indicators for harmonising built environment assessment systems in relation to SDGs. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *588*, 022027. [CrossRef]
125. Gepts, B.; Nuyts, E.; Verbeeck, G. Renovation rate as a tool towards achieving SDGs 11 and 13. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *588*, 042010. [CrossRef]
126. Zhao, X.; Castka, P.; Searcy, C. Iso standards: A platform for achieving sustainable development goal 2. *Sustainability* **2020**, *12*, 9332. [CrossRef]
127. Hussain, S.; Javadi, D.; Andrey, J.; Ghaffar, A.; Labonté, R. Health intersectoralism in the Sustainable Development Goal era: From theory to practice. *Global. Health* **2020**, *16*, 15. [CrossRef]
128. Filho, W.L.; Brandli, L.L.; Salvia, A.L.; Rayman-Bacchus, L.; Platje, J. COVID-19 and the UN sustainable development goals: Threat to solidarity or an opportunity? *Sustainability* **2020**, *12*, 5343. [CrossRef]
129. Chaves-Avila, R.; Gallego-Bono, J.R. Transformative policies for the social and solidarity economy: The new generation of public policies fostering the social economy in order to achieve sustainable development goals. The European and Spanish cases. *Sustainability* **2020**, *12*, 4059. [CrossRef]
130. Lizikova, M. Nuclear energy prospects and legal challenges towards achieving sustainable development goals. *E3S Web Conf.* **2020**, *208*, 02009. [CrossRef]
131. Derlukiewicz, N.; Mempel-Śniezyk, A.; Mankowska, D.; Dyjakon, A.; Minta, S.; Pilawka, T. How do clusters foster sustainable development? An analysis of EU policies. *Sustainability* **2020**, *12*, 1297. [CrossRef]
132. Meuleman, L. Public administration and governance for the sdgs: Navigating between change and stability. *Sustainability* **2021**, *13*, 5914. [CrossRef]
133. Bornemann, B.; Christen, M. A new generation of sustainability governance: Potentials for 2030 agenda implementation in Swiss cantons. *Politics Gov.* **2021**, *9*, 187–199. [CrossRef]
134. Molocchi, A. Circular economy and environmental sustainability: A policy coherence analysis of current italian subsidies. *Sustainability* **2021**, *13*, 8150. [CrossRef]
135. Ahmed, A.A.; Nazzal, M.A.; Darras, B.M. Cyber-Physical Systems as an Enabler of Circular Economy to Achieve Sustainable Development Goals: A Comprehensive Review. *Int. J. Precis. Eng. Manuf. Green Technol.* **2021**, *9*, 955–975. [CrossRef]
136. Naidoo, D.; Nhamo, L.; Lottering, S.; Mpandeli, S.; Liphadzi, S.; Modi, A.T.; Trois, C.; Mabhaudhi, T. Transitional pathways towards achieving a circular economy in the water, energy, and food sectors. *Sustainability* **2021**, *13*, 9978. [CrossRef]
137. Žalėnienė, I.; Pereira, P. Higher Education For Sustainability: A Global Perspective. *Geogr. Sustain.* **2021**, *2*, 99–106. [CrossRef]

138. Leal Filho, W.; Frankenberger, F.; Salvia, A.L.; Azeiteiro, U.; Alves, F.; Castro, P.; Will, M.; Platje, J.; Lovren, V.O.; Brandli, L.; et al. A framework for the implementation of the Sustainable Development Goals in university programmes. *J. Clean. Prod.* **2021**, *299*, 126915. [CrossRef]
139. Zhou, C.; Etzkowitz, H. Triple helix twins: A framework for achieving innovation and un sustainable development goals. *Sustainability* **2021**, *13*, 6535. [CrossRef]
140. Mallick, S.K. Prediction-Adaptation-Resilience (PAR) approach—A new pathway towards future resilience and sustainable development of urban landscape. *Geogr. Sustain.* **2021**, *2*, 127–133. [CrossRef]
141. Araujo, C.L.; Picavet, M.E.B.; Sartoretto, C.A.P.d.S.; Riva, E.D.; Hollaender, P.S. Ecocentric management mindset: A framework for corporate sustainability. *Crit. Perspect. Int. Bus.* **2021**, *18*, 518–545. [CrossRef]
142. Maksymiv, Y.; Yakubiv, V.; Pylypiv, N.; Hryhoruk, I.; Piatnychuk, I.; Popadynets, N. Strategic challenges for sustainable governance of the bioeconomy: Preventing conflict between sdgs. *Sustainability* **2021**, *13*, 8308. [CrossRef]
143. Sousa, M.; Almeida, M.F.; Calili, R. Multiple Criteria Decision Making for the Achievement of the UN Sustainable Development Goals: A Systematic Literature Review and a Research Agenda. *Sustainability* **2021**, *13*, 4129. [CrossRef]
144. Mondejar, M.E.; Avtar, R.; Diaz, H.L.B.; Dubey, R.K.; Esteban, J.; Gómez-Morales, A.; Hallam, B.; Mbungu, N.T.; Okolo, C.C.; Prasad, K.A.; et al. Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet. *Sci. Total Environ.* **2021**, *794*, 148539. [CrossRef]
145. De Cámara, E.S.; Fernández, I.; Castillo-Eguskitza, N. A holistic approach to integrate and evaluate sustainable development in higher education. The case study of the university of the Basque Country. *Sustainability* **2021**, *13*, 392. [CrossRef]
146. Koffler, S.; Barbiéri, C.; Ghilardi-Lopes, N.P.; Leocadio, J.N.; Albertini, B.; Francoy, T.M.; Saraiva, A.M. A buzz for sustainability and conservation: The growing potential of citizen science studies on bees. *Sustainability* **2021**, *13*, 959. [CrossRef]
147. Shen, H.; Ali, S.A.; Alharthi, M.; Shah, A.S.; Khan, A.B.; Abbas, Q.; Rahman, S.U. Carbon-free energy and sustainable environment: The role of human capital and technological revolutions in attaining sdgs. *Sustainability* **2021**, *13*, 2636. [CrossRef]
148. Su, Q.; Chen, K. Constructing a Water-Energy-Food Efficiency Coupling Model from the Perspective of Land Use. *Adv. Transdiscipl. Eng.* **2021**, *17*, 320–324. [CrossRef]
149. Rybak, A.; Rybak, A.; Kolev, S.D. Analysis of the eu-27 countries energy markets integration in terms of the sustainable development sdg7 implementation. *Energies* **2021**, *14*, 7079. [CrossRef]
150. Elbardisy, A.; William, Y.; Sherif, M.; Aboulnaga, M.; Guedes, M. Sustainable refurbishment of abandoned urban areas: The case study of former SIAPA area, Galliera—Bologna, Italy. *IOP Conf. Ser. Earth Environ. Sci.* **2021**, *863*, 012014. [CrossRef]
151. Krellenberg, K.; Koch, F. How to support German cities in implementing the SDGs-learning from and about co-design. *Global. Sustain.* **2021**, *4*, E18. [CrossRef]
152. Grochová, L.I.; Litzman, M. The efficiency in meeting measurable sustainable development goals. *Int. J. Sustain. Dev. World Ecol.* **2021**, *28*, 709–719. [CrossRef]
153. Martínez-Córdoba, P.J.; Amor-Esteban, V.; Benito, B.; García-Sánchez, I.M. The commitment of spanish local governments to sustainable development goal 11 from a multivariate perspective. *Sustainability* **2021**, *13*, 1222. [CrossRef]
154. Palomares, I.; Martínez-Cámara, E.; Montes, R.; García-Moral, P.; Chiachio, M.; Chiachio, J.; Alonso, S.; Melero, F.J.; Molina, D.; Fernández, B.; et al. A panoramic view and swot analysis of artificial intelligence for achieving the sustainable development goals by 2030: Progress and prospects. *Appl. Intell.* **2021**, *51*, 6497–6527. [CrossRef]
155. 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]
156. Frank, S.; Gusti, M.; Havlík, P.; Lauri, P.; Di Fulvio, F.; Forsell, N.; Hasegawa, T.; Krisztin, T.; Palazzo, A.; Valin, H. Land-based climate change mitigation potentials within the agenda for sustainable development. *Environ. Res. Lett.* **2021**, *16*, 024006. [CrossRef]
157. Máté, D.; Novotny, A.; Meyer, D.F. The impact of sustainability goals on productivity growth: The moderating role of global warming. *Int. J. Environ. Res. Public Health* **2021**, *18*, 11034. [CrossRef]
158. Sobczyk, W.; Sobczyk, E.J. Varying the energy mix in the eu-28 and in poland as a step towards sustainable development. *Energies* **2021**, *14*, 1502. [CrossRef]
159. Breu, T.; Bergöö, M.; Ebneter, L.; Pham-Truffert, M.; Bieri, S.; Messerli, P.; Ott, C.; Bader, C. Where to begin? Defining national strategies for implementing the 2030 Agenda: The case of Switzerland. *Sustain. Sci.* **2021**, *16*, 183–201. [CrossRef]
160. Lopatkova, Y. Achieving sustainable development: A baseline analysis of Western and Eastern European countries. *R-Economy* **2021**, *7*, 18–27. [CrossRef]
161. Calicioglu, Ö.; Bogdanski, A. Linking the bioeconomy to the 2030 sustainable development agenda: Can SDG indicators be used to monitor progress towards a sustainable bioeconomy? *New Biotechnol.* **2021**, *61*, 40–49. [CrossRef]
162. Lyaskovskaya, E.; Khudyakova, T. Sharing economy: For or against sustainable development. *Sustainability* **2021**, *13*, 11056. [CrossRef]
163. Alexakis, D.E. Linking dpsir model and water quality indices to achieve sustainable development goals in groundwater resources. *Hydrology* **2021**, *8*, 90. [CrossRef]
164. Back, Y.; Bach, P.M.; Jasper-Tönnies, A.; Rauch, W.; Kleidorfer, M. A rapid fine-scale approach to modelling urban bioclimatic conditions. *Sci. Total Environ.* **2021**, *756*, 143732. [CrossRef]

165. Aquilino, M.; Adamo, M.; Blonda, P.; Barbanente, A.; Tarantino, C. Improvement of a dasymetric method for implementing sustainable development goal 11 indicators at an intra-urban scale. *Remote Sens.* **2021**, *13*, 2835. [CrossRef]
166. Schwindenhammer, S.; Gonglach, D. Sdg implementation through technology? Governing food-water-technology nexus challenges in urban agriculture. *Politics Gov.* **2021**, *9*, 176–186. [CrossRef]
167. Hannan, M.A.; Al-Shetwi, A.Q.; Ker, P.J.; Begum, R.A.; Mansor, M.; Rahman, S.A.; Dong, Z.Y.; Tiong, S.K.; Mahlia, T.M.I.; Muttaqi, K.M. Impact of renewable energy utilization and artificial intelligence in achieving sustainable development goals. *Energy Rep.* **2021**, *7*, 5359–5373. [CrossRef]
168. Aysan, A.F.; Bergigui, F.; Disli, M. Blockchain-based solutions in achieving sdgs after COVID-19. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 151. [CrossRef]
169. Abosaq, N.H. Blockchain enabled IoTs towards achieving the Sustainable Development Goals. *3C Tecnol. Innovación Apl. Pyme* **2021**, 23–33. [CrossRef]
170. Rath, P.; Jindal, M.; Jindal, T. A review on economically-feasible and environmental-friendly technologies promising a sustainable environment. *Clean. Eng. Technol.* **2021**, *5*, 100318. [CrossRef]
171. Nasar, W.; Hameed, I.A.; Giarré, L. Solid waste Management as a Sustainable Social Enterprise Model. In Proceedings of the 2021 29th Mediterranean Conference on Control and Automation (MED), Puglia, Italy, 22–25 June 2021; pp. 255–260. [CrossRef]
172. Diaz-Iglesias, S.; Blanco-Gonzalez, A.; Orden-Cruz, C. Theoretical framework for sustainability, corporate social responsibility and change management. *J. Sustain. Sci. Manag.* **2021**, *16*, 315–332. [CrossRef]
173. Ridzuan, F.; Zainon, W.M.N.W. Diagnostic analysis for outlier detection in big data analytics. *Procedia Comput. Sci.* **2021**, *197*, 685–692. [CrossRef]
174. Štampach, R.; Herman, L.; Trojan, J.; Tajovská, K.; Řezník, T. Humanitarian mapping as a contribution to achieving sustainable development goals: Research into the motivation of volunteers and the ideal setting of mapathons. *Sustainability* **2021**, *13*, 13991. [CrossRef]
175. García-peña, C.; González-medina, M.; Diaz-sarachaga, J.M. Assessment of the governance dimension in the frame of the 2030 agenda: Evidence from 100 Spanish cities. *Sustainability* **2021**, *13*, 5519. [CrossRef]
176. Berger, M.; Campos, J.; Carolli, M.; Dantas, I.; Forin, S.; Kosatica, E.; Kramer, A.; Mikosch, N.; Nouri, H.; Schlattmann, A.; et al. Advancing the Water Footprint into an Instrument to Support Achieving the SDGs—Recommendations from the 'Water as a Global Resources' Research Initiative (GRoW). *Water Resour. Manag.* **2021**, *35*, 1291–1298. [CrossRef]
177. Alawneh, R.; Jannoud, I.; Rabayah, H.; Ali, H. Developing a novel index for assessing and managing the contribution of sustainable campuses to achieve un sdgs. *Sustainability* **2021**, *13*, 11770. [CrossRef]
178. Esteves, A.M.; Genus, A.; Henfrey, T.; Penha-Lopes, G.; East, M. Sustainable entrepreneurship and the Sustainable Development Goals: Community-led initiatives, the social solidarity economy and commons ecologies. *Bus. Strateg. Environ.* **2021**, *30*, 1423–1435. [CrossRef]
179. Krellenberg, K.; Koch, F. Conceptualizing interactions between sdgs and urban sustainability transformations in CoVID-19 times. *Politics Gov.* **2021**, *9*, 200–210. [CrossRef]
180. Zheng, X.; Wang, R.; Hoekstra, A.Y.; Krol, M.S.; Zhang, Y.; Guo, K.; Sanwal, M.; Sun, Z.; Zhu, J.; Zhang, J.; et al. Consideration of culture is vital if we are to achieve the Sustainable Development Goals. *One Earth* **2021**, *4*, 307–319. [CrossRef]
181. Mattos, K.J.; Mulhern, R.; Naughton, C.C.; Anthonj, C.; Brown, J.; Brocklehurst, C.; Brooks, C.; Desclos, A.; Escobedo Garcia, N.E.; Gibson, J.M.; et al. Reaching those left behind: Knowledge gaps, challenges, and approaches to achieving SDG 6 in high-income countries. *J. Water Sanit. Hyg. Dev.* **2021**, *11*, 849–859. [CrossRef]
182. Fei, W.; Opoku, A.; Agyekum, K.; Oppon, J.A.; Ahmed, V.; Chen, C.; Lok, K.L. The critical role of the construction industry in achieving the sustainable development goals (Sdgs): Delivering projects for the common good. *Sustainability* **2021**, *13*, 9112. [CrossRef]
183. Del Arco, I.; Ramos-Pla, A.; Zsembinszki, G.; de Gracia, A.; Cabeza, L.F. Implementing sdgs to a sustainable rural village development from community empowerment: Linking energy, education, innovation, and research. *Sustainability* **2021**, *13*, 12946. [CrossRef]
184. Olabi, A.G.; Obaideen, K.; Elsaid, K.; Wilberforce, T.; Sayed, E.T.; Maghrabie, H.M.; Abdelkareem, M.A. Assessment of the pre-combustion carbon capture contribution into sustainable development goals SDGs using novel indicators. *Renew. Sustain. Energy Rev.* **2022**, *153*, 111710. [CrossRef]
185. Arsova, S.; Genovese, A.; Ketikidis, P.H. Implementing circular economy in a regional context: A systematic literature review and a research agenda. *J. Clean. Prod.* **2022**, *368*, 133117. [CrossRef]
186. Arlidge, W.N.S.; Bull, J.W.; Addison, P.F.E.; Burgass, M.J.; Gianuca, D.; Gorham, T.M.; Jacob, C.D.S.; Shumway, N.; Sinclair, S.P.; Watson, J.E.M.; et al. A Global Mitigation Hierarchy for Nature Conservation. *Bioscience* **2018**, *68*, 336–347. [CrossRef] [PubMed]
187. SDSN Australia/Pacific. Getting Started with the SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector. Australia, New Zealand and Pacific Edition. 2017. Available online: https://resources.unsdsn.org/getting-started-with-the-sdgs-in-universities (accessed on 28 March 2023).
188. Robinson, L.D.; Cawthray, J.L.; West, S.E.; Bonn, A.; Ansine, J. Ten Principles of Citizen Science. In *Citizen Science: Innovation in Open Science, Society and Policy*; Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J., Bonn, A., Eds.; UCL Press: London, UK, 2018; pp. 1–23.
189. Tappeiner, U.; Borsdorf, A.; Tasser, E. *Alpenatlas. Mapping the Alps*; Spektrum Akademischer Verlag: Heidelberg, Germany, 2008.

190. UI Green Metric. UI GreenMetric World University Rankings. 2022. Available online: https://greenmetric.ui.ac.id/publications/guidelines/2022/english (accessed on 14 February 2022).
191. Genta, C.; Sanyé-Mengual, E.; Sala, S.; Lombardi, P. The Consumption Footprint as possible indicator for environmental impact evaluation at city level. The case study of Turin (Italy). *Sustain. Cities Soc.* **2022**, *79*, 103679. [CrossRef]
192. Hickmann, T.; Schwindenhammer, S. Locating Cities and Their Governments in Multi-Level Sustainability Governance. *Politics Gov.* **2021**, *9*, 211–220. [CrossRef]
193. OECD. *A Territorial Approach to the Sustainable Development Goals*; OECD: Paris, France, 2020.
194. Pollo, R.; Trane, M.; Giovanardi, M. Urban Metabolism, interdisciplinary models and design at micro-urban scale. *Techne* **2021**, *21*, 154–164. [CrossRef]
195. Pollo, R.; Trane, M. Adaptation, Mitigation, and Smart Urban Metabolism towards the Ecological Transition. In *Possible and Preferable Scenarios of a Sustainable Future. Towards 2030 and Beyond*; Sposito, C., Ed.; Palermo University Press: Palermo, Italy, 2021; pp. 74–89.
196. Lombardi, P.; Ferretti, V. New spatial decision support systems for sustainable urban and regional development. *Smart Sustain. Built Environ.* **2015**, *4*, 45–66. [CrossRef]
197. European Commission. COM/2022/230 Final 'REPowerEU Plan'. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN (accessed on 20 February 2023).
198. Verner, G.; Schütte, S.; Knop, J.; Sankoh, O.; Sauerborn, R. Health in climate change research from 1990 to 2014: Positive trend, but still underperforming. *Glob. Health Action* **2016**, *9*. [CrossRef] [PubMed]
199. HLPF. Bolstering Local Action to Control the Pandemic and Accelerate Implementation. Background Note. 2020. Available online: https://sustainabledevelopment.un.org/content/documents/264851Background_note_Bolstering_Local_Action.pdf (accessed on 15 February 2023).
200. United Nations. A World That Counts. 2014. Available online: www.undatarevolution.org (accessed on 19 December 2021).
201. European Commission. COM/2020/28: A New Circular Economy Action Plan. For a Cleaner and More Competitive Europe. 2020. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN (accessed on 19 August 2022).
202. Commission of the European Communities. *Integrated Product Policy—Building on Environmental Life-Cycle Thinking*; COM/2003/302; Commission of the European Communities: Brussels, Belgium, 2003.
203. Scrucca, F.; Ingrao, C.; Barberio, G.; Matarazzo, A.; Lagioia, G. On the role of sustainable buildings in achieving the 2030 UN sustainable development goals. *Environ. Impact Assess. Rev.* **2023**, *100*, 107069. [CrossRef]
204. Sanyé-Mengual, E.; Sala, S. Life Cycle Assessment support to environmental ambitions of EU policies and the Sustainable Development Goals. *Integr. Environ. Assess. Manag.* **2022**, *18*, 1221–1232. [CrossRef]
205. Mancini, L.; Valente, A.; Barbero Vignola, G.; Sanyé Mengual, E.; Sala, S. Social footprint of European food production and consumption. *Sustain. Prod. Consum.* **2023**, *35*, 287–299. [CrossRef]
206. Valenzuela-Fernandez, L.; Merigó, J.M.; Lichtenthal, J.D.; Nicolas, C. A Bibliometric Analysis of the First 25 Years of the Journal of Business-to-Business Marketing. *J. Bus.-to-Bus. Mark.* **2019**, *26*, 75–94. [CrossRef]
207. Di Vaio, A.; Hassan, R.; Chhabra, M.; Arrigo, E.; Palladino, R. Sustainable entrepreneurship impact and entrepreneurial venture life cycle: A systematic literature review. *J. Clean. Prod.* **2022**, *378*, 134469. [CrossRef]
208. European Commission. Delivering on the UN's Sustainable Development Goals. A Comprehensive Approach. 2020. Available online: https://commission.europa.eu/system/files/2020-11/delivering_on_uns_sustainable_development_goals_factsheet_en.pdf (accessed on 23 September 2022).
209. Sachs, J.D.; Schmidt-Traub, G.; Mazzucato, M.; Messner, D.; Nakicenovic, N.; Rockström, J. Six Transformations to achieve the Sustainable Development Goals. *Nat. Sustain.* **2019**, *2*, 805–814. [CrossRef]
210. Nilsson, M.; Griggs, D.; Visbeck, M. Policy: Map the interactions between Sustainable Development Goals. *Nature* **2016**, *534*, 320–322. [CrossRef] [PubMed]
211. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. [CrossRef] [PubMed]