

Systematic Review

Multiple Criteria Decision Making for the Achievement of the UN Sustainable Development Goals: A Systematic Literature Review and a Research Agenda

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Abstract: Multiple-criteria decision making (MCDM) methods have been widely employed in various fields and disciplines, including decision problems regarding Sustainable Development (SD) issues. The main objective of this paper is to present a systematic literature review (SLR) on MCDM methods supporting decisions focusing on the achievement of UN Sustainable Development Goals (SDGs) and the implementation of the 2030 Agenda for Sustainable Development in regional, national, or local contexts. In this regard, 143 published scientific articles from 2016 to 2020 were retrieved from the Scopus database, selected and reviewed. They were categorized according to the decision problem associated with SDGs issues, the MCDM methodological approach, including the use (or not) of fuzzy set theory, sensitivity analysis, and multistakeholder approaches, the context of MCDM applications, and the MCDM classification (if utility-based, compromise, multi-objective, outranking, or other MCDM methods). The widespread adoption of MCDM methods in complex contexts confirms that they can help decision-makers solve multidimensional problems associated with key issues within the 2030 Agenda framework. Besides, the state-of-art review provides an improved understanding of this research field and directions for building a research agenda for those interested in advancing the research on MCDM applications in issues associated with the 2030 Agenda framework.

Keywords: multicriteria decision-making methods; MCDM; UN sustainable development goals; 2030 agenda; systematic literature review



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1. Introduction

The 2030 Agenda comprises 17 Sustainable Development Goals (SDGs) and 169 global targets, all oriented to a systemic vision for a better and sustainable world. In September 2015, the SDGs were established by Heads of State and Government and High Representatives of 193 countries on a participatory basis [1].

The SDGs are a set of 17 interlinked goals designed to be a “blueprint to achieve a better and more sustainable future for all” [2]. They are: (i) “No Poverty”, (ii) “Zero Hunger”, (iii) “Good Health and Well-being”, (iv) “Quality Education”, (v) “Gender Equality”, (vi) “Clean Water and Sanitation”, (vii) “Affordable and Clean Energy”, (viii) “Decent Work and Economic Growth”, (ix) “Industry, Innovation and Infrastructure”, (x) “Reduced Inequalities”, (xi) “Sustainable Cities and Communities”, (xii) “Responsible Consumption and Production”, (xiii) “Climate Action”, (xiv) “Life Below Water”, (xv) “Life On Land”, (xvi) “Peace, Justice, and Strong Institutions”, and (xvii) “Partnerships for the Goals”.

Following the stages of a generic policy-planning towards global targets achievement by 2030, the implementation of the 2030 Agenda framework started in 2016. From that time, an increasing number of guidelines, frameworks, methodological assessments, and academic studies on this subject have been published [3–21]. Nevertheless, all SDGs’ achievements require decision-making processes, usually in complex contexts, considering multiple criteria, synergies, and trade-offs between objectives. Accordingly, the request for

methods to assess future risks and support decision-making for sustainability has increased time after time.

In the last decade, multiple criteria decision-making (MCDM) methods have been widely considered by researchers, scientists, and practitioners. MCDM is a branch of operational research dealing with finding optimal results in complex scenarios, including various indicators, conflicting objectives, and criteria. Due to the flexibility for decision-makers to take decisions while considering all the criteria and objectives simultaneously, MCDM methods have significant applications in several research fields, including management, engineering, science, and business.

As a result of growing interest by academicians and practitioners in this subject, an increasing number of scientific and technical documents have been published from 2010 to 2020. By 2009, 4606 scientific documents on MCDM methods had been published and indexed in the Scopus database, while in the last two decades, the number of articles grew to 19,671 documents.

Covering the time frame 2010 to 2020 and focusing more specifically on previous studies that employed the systematic literature review (SLR) approach to give a comprehensive overview of what has been done in the MCDM research field, a literature search was conducted accessing documents from the Scopus database. This search yielded 70 reviews, but only a few are concerned with MCDM applications for sustainable development issues [22–28].

Kumar et al. (2017) [22] have reviewed MCDM techniques for renewable energy development. They developed an insight into various MCDM techniques, discussed progress made by considering renewable energy applications over MCDM methods and prospects in this area.

To provide a systematic literature review on the application and use of decision-making approaches regarding energy management problems, Mardani et al. (2016) [23] selected and reviewed 196 published papers from 1995 to 2015, chosen from the “Web of Science” database. They concluded that hybrid MCDM and fuzzy MCDM approaches (27.92%) had been used more than other approaches. Besides, AHP (Analytic Hierarchy Process) and fuzzy AHP approaches (24.87%) had the second rank. ELECTRE (Elimination et Choix Traduisant la Réalité), fuzzy ELECTRE, and multicriteria analysis approaches with 25 papers had the third and fourth rank (12.69%). Moreover, TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), fuzzy TOPSIS, PROMETHEE (Preference Ranking Organization Method for Enrichment of Evaluations), and fuzzy PROMETHEE held fifth and sixth rank with ten papers (5.08%).

Based on a review of 163 articles, Rigo et al. [24] identified the most common MCDM methods adopted in the renewable energy area and the decision problems they helped to solve. The authors identified five decision problems in this area: source selection, location, sustainability, project performance, and technological performance. They also associated the MCDM methods in each article with five evaluation steps of the MCDM process, i.e., alternative selection, criteria selection, criteria weighting, alternative evaluation, and post-assessment analysis.

Bhardwaj et al. [25] investigated how MCDM approaches have been employed in energy policy decisions for considering multiple social and environmental objectives. They review 167 articles and concluded that MCDM methods could help the implementation challenges of the SDGs and the Paris Agreement, which create incentives for energy decision-makers to consider development and climate issues simultaneously.

Malek and Desai (2020) [26] investigated how sustainable manufacturing research has grown in the last few years by conducting a comprehensive descriptive study through a systematic literature review of 541 selected articles (from January 2001 to March 2019). Out of these articles, only 122 (22.55%) studies are reported with the application of MCDM methods which shows the limited interest of researchers in ranking and prioritizing the significant factors of sustainable manufacturing. The content analysis identified that AHP/fuzzy AHP is the most utilized MCDM method with 30 manuscripts, followed by

TOPSIS/fuzzy TOPSIS with 19 and DEMATEL (Decision Making Trial and Evaluation Laboratory) with 16 publications.

Santos et al. (2019) [27] conducted a systematic literature review on the AHP method supporting decision-making for sustainable development. In this regard, they analyzed and reviewed 173 manuscripts published between 2014 and 2018, which were indexed by the Web of Science, Scopus, and Science Direct databases. Their findings objectively mapped the advancements in the state-of-the-art of the AHP method's contributions for sustainable development issues. Implications for research and practice, as well as promising challenges for further research, were presented.

Kandakoglu et al. (2019) [28] presented a systematic review of the literature on MCDM methods, covering 343 articles dealing with decision-making in sustainable development contexts, published in the period from 2010 to 2017. The selected articles were reviewed and categorized by MCDM approach, as follows: preference modeling, uncertainty approaches, sensitivity analysis, long-term assessment, and stakeholder involvement. The results showed that AHP/ANP (AHP/Analytic Network Process) were the most used among the MCDM methods, followed by TOPSIS-VIKOR (TOPSIS-Viekkriterijumsko KOMpromisno Rangiranje), ELECTRE, PROMETHEE, and MAUT (Multi-Attribute Utility Theory). For future studies, the authors suggested that decision-making processes should closely investigate social well-being and encourage the participation of stakeholders.

Although MCDM contributions to SD issues have been highlighted in these previous reviews, to the best of our knowledge, no systematic review has been performed that focused on the achievement of SDGs within the 2030 Agenda framework. So, a systematic literature review on the MCDM applications addressed to SDGs' achievements in regional, national, or local contexts emerged as a research gap to be investigated and expanding previous reviews' scope. So, the research questions addressed in this paper are:

- Considering the context of the decision-making process within the Agenda 2030 framework, what types of results from the MCDM applications are expected to help decision-makers solve multidimensional problems associated with SDGs?
- What are the main MCDM methodological approaches adopted in studies focusing on decision issues within the 2030 Agenda framework?
- For which SDGs, is there a higher incidence of MCDM applications? In which contexts have these applications been developed? Local, national, or regional?
- From the state-of-art review, which research directions can be identified to build a research agenda on this topic?

Therefore, this paper aims to present a systematic literature review (SLR) on the MCDM applications to decision-problems regarding SDGs' achievements within the 2030 Agenda framework in different contexts. In this regard, 143 published scientific articles from 2016 to 2020 were retrieved from the Scopus database, selected, and reviewed.

All the selected papers were categorized according to the decision problem associated with SDGs issues, the MCDM methodological approach, the use (or not) of fuzzy set theory, sensitivity analysis, and multistakeholder approaches, the context of MCDM applications, and the MCDM classification (if utility-based, compromise, multi-objective, outranking, or other MCDM methods).

The article is structured in five sections. Following the introduction, the second section describes the methodology adopted for searching relevant articles, refining the search, and then making a final selection of the most relevant articles. Section 3 presents a descriptive analysis of the reviewed articles to characterize the scientific production profile in this research topic. Section 4 presents and discusses the key findings regarding the in-depth analysis of the literature on MCDM applications for SDGs achievement. The reviewed articles were classified into five categories: (i) the 2030 Agenda for Sustainable Development; (ii) multiple SDGs; (iii) economy (SDG 8, SDG 9, SDG 10, and SDG 12); (iv) society (SDG 2, SDG 3, SDG 4, SDG7, and SDG 11), and (v) biosphere (SDG 6, SDG 13, SDG 14, and SDG 15). Lastly, Section 5 synthesizes the concluding remarks and proposes a

research agenda for those interested in advancing the research on MCDM applications in decision issues associated with the 2030 Agenda framework.

2. Methodology

A systematic literature review is a research methodology designed to identify, evaluate, and interpret all available researches relevant to a particular research question, or topic area, or phenomenon of interest [29]. In order to ensure that the findings were obtained in a reliable and valid manner, this review followed a three-stage approach as proposed by Tranfield et al. [30] and Denyer and Tranfield [31], namely: (i) planning the review, (ii) conducting the review by analyzing scientific articles, and (iii) reporting emerging themes and recommendations for future studies. Figure 1 represents the review process and its results per stage.

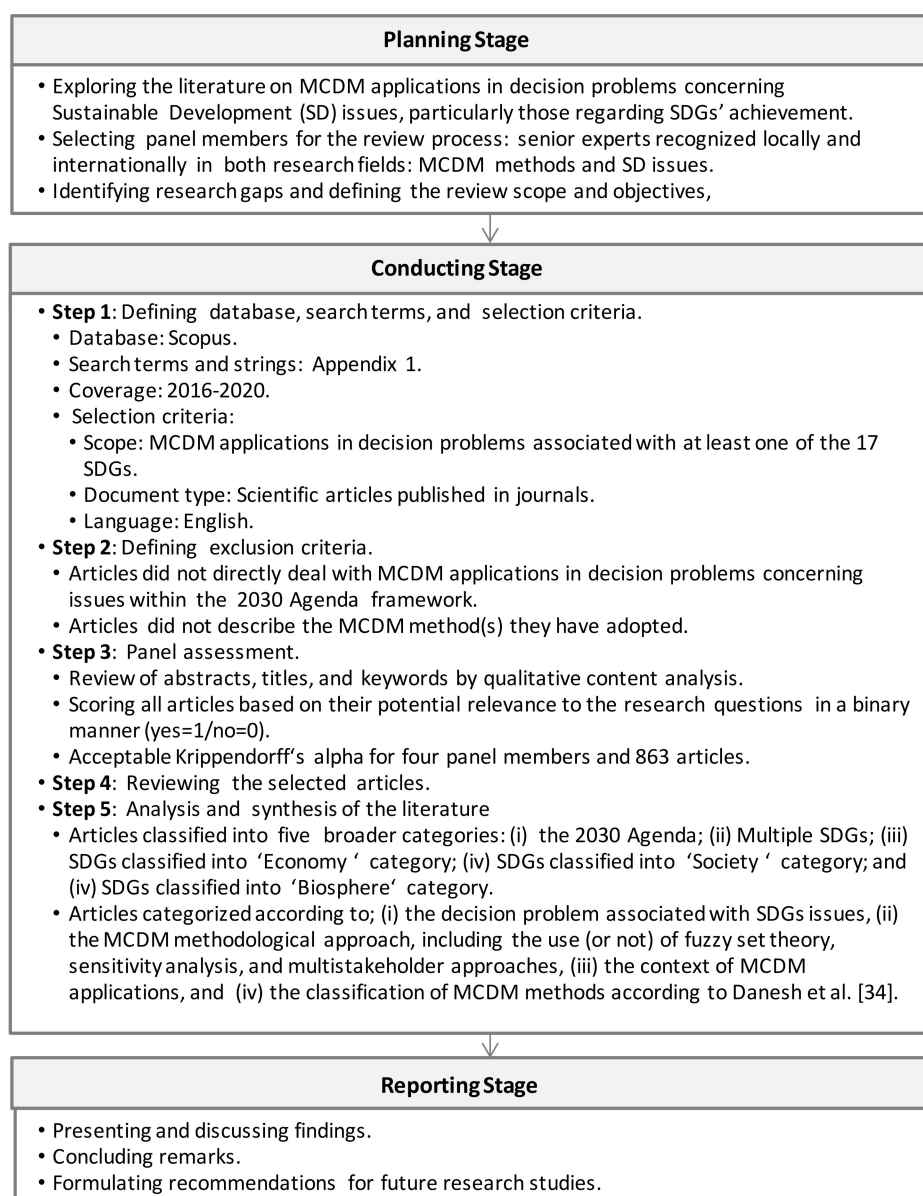


Figure 1. The review process according to [30,31].

2.1. Planning Stage

The planning stage comprised three steps: (i) exploring the literature on applications of MCDM in decision problems concerning Sustainable Development (SD) issues, particularly

within the 2030 Agenda framework; (ii) selecting panel members for the review process; and (iii) identifying research gaps and defining review scope and objectives.

In this stage, an exploratory search on MCDM literature in Scopus covering the time frame 2010 to 2020 was conducted to identify previous studies on the research topic that employed the SLR approach. This search yielded 70 reviews, but only a few were concerned with MCDM applications in decision problems concerning SD issues. None gave a comprehensive view of the MCDM approaches focusing on the achievement of UN Sustainable Development Goals (SDGs) within the 2030 Agenda framework. So, a research gap to be investigated was identified in the planning stage.

To integrate the review panel, the authors selected four senior experts recognized locally and internationally in both fields—MCDM approaches and Sustainable Development—MCDM methods and Sustainable Development (SD)—to identify and refine the study's objectives and develop review protocols. The selection was impartial and based on an objective search in the National Directory of Research Groups organized by the National Research Council (authors' country). Ethical and representativeness issues were considered for this selection, avoiding conflicts of interest and biases in judgments. None of them are co-authors of this paper or related to them.

2.2. Conducting Stage

The conducting stage involved the systematic search on the Scopus database covering the period from 2016 to 2020. The choice of this time-frame and keywords was aligned with the establishment of the “2030 Agenda for Sustainable Development” on 25 September 2015 by Heads of State and Government at a special UN summit. Search history in the Scopus database is presented in Appendix A, Table 1.

As shown in Figure 1, the selection criteria were: (i) scientific articles published in journals; (ii) articles whose scopes refer to MCDM applications in decision problems associated with at least one of the 17 SDGs, and (iii) articles written in English. Articles written in languages other than English were excluded a priori because the further analysis of full manuscripts in other languages could be very complicated.

Table 1 shows the bibliographic data collection of a total of 863 documents, resulting from the pre-processing conducted with the support of Bibliometrix, an open-source R-package environment for bibliometric analysis developed by Aria and Cuccurullo [32].

Table 1. Bibliographic data collection.

Description	Results
Documents	863
Sources (journals, books, among others)	294
Author's keywords (DE)	2590
Period	2016–2020
Average citations per document	13.37
Authors	2481
Author appearances	3254
Authors of single-authored documents	32
Authors of multi-authored documents	2449
Single-authored documents	35
Documents per author	0.35
Authors per document	2.87
Co-authors per document	3.77

The 863 articles retrieved from the Scopus database were organized on a worksheet Microsoft® Office Excel (Microsoft Corporation, Washington, WA, USA) in a way that the panel members could analyze and assign relevance scores in an independent mode. So, they analyzed the keywords, titles, and abstracts of the 863 downloaded articles to select the articles for this systematic literature review based on the exclusion criteria previously defined, namely: (i) articles did not directly deal with MCDM applications to decision-problems regarding SDGs' achievement within the 2030 Agenda framework, and (ii) articles did not describe the MCDM approach they have adopted.

The panel members scored all papers based on their potential relevance to the research topic in a binary manner (yes = 1/no = 0), resulting in scores from 0 (min) to 4 (max). As a result of this process, 143 articles gained the highest score of 4 (cluster 1), 342 articles obtained a score of 3 (cluster 2), 55 got scores of 2 and 1 (cluster 3), and 355 score 0 (cluster 4). Given the large number of documents grouped in clusters 1 and 2 (485 articles), the panel members decided to include only cluster 1 for further analysis. Backward citation search was not considered in this case since the articles regarding the 2030 Agenda framework began to be published only in 2016, according to the Scopus database's search results. Throughout the conducting stage, a systematic approach for protocol development and searches on Scopus Database was followed to eliminate the risks of bias related to the SLR methodology's inappropriate use, as proposed by [30,31]. Besides, the participation of four senior panel members and the proper definition of inclusion/exclusion criteria mitigated the risk of bias during the selection process. They could complete their judgments on the relevance of the downloaded articles, and the whole process's reliability was achieved. Panel member's agreement met with an acceptable Krippendorff's alpha of 0.681.

2.3. Reporting Stage

From the final stage of the review process, descriptive statistics and qualitative content analysis of the selected articles were reported and discussed, as well as recommendations for future research.

3. Descriptive Analysis

The profile of the scientific production in this research field covers: (i) the annual evolution of scientific production (2016–2020), (ii) MCDM applications concerning the 2030 Agenda framework (i.e., the 2030 Agenda as a whole, multiple SDGs, and single SDGs classified into three broader categories), (iii) MCDM methods applied to the 2030 Agenda Framework, (iv) MCDM methodological approaches, (v) contexts of MCDM applications, and (vi) sources with the most significant number of publications.

3.1. Annual Evolution of Scientific Production: 2016–2020

Figure 2 shows the annual evolution of scientific production on MCDM applications addressed to SDGs' achievement from 2016 to 2020, based on the 143 reviewed papers.

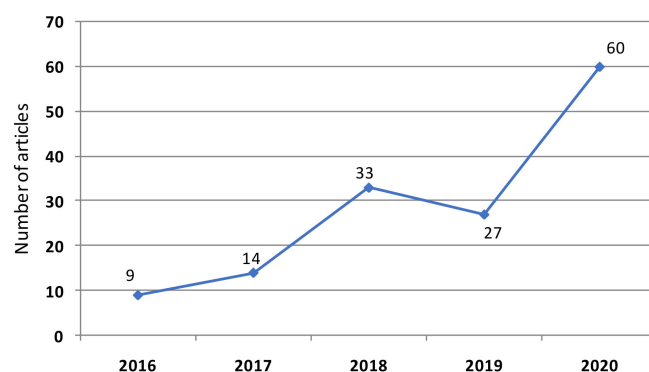


Figure 2. Annual scientific production from 2016 to 2020.

As can be observed in Figure 2, right after the launch of the 2030 Agenda in 2016, the growth rate of publications in 2016–2017 was 56%. However, in the last two years (2019–2020), the rate achieves 122%, which indicates the spread of MCDM applications in decision objectives concerning SDGs issues in various contexts at different levels.

3.2. MCDM Applications concerning the 2030 Agenda Framework

Table 2 shows the distribution of the reviewed articles within the 2030 Agenda framework.

Table 2. The 2030 Agenda framework issues and MCDM applications.

MCDM Applications	SDG	Number of Articles
The 2030 Agenda for Sustainable Development	All SDGs	5
Multiple SDGs	Nexus approaches	13
	SDG8	6
Economy: SDG 8, SDG 9, SDG 10, and SDG 12	SDG9	15
	SDG10	2
	SDG12	10
	SDG2	11
Society: SDG 2, SDG 3, SDG 4, SDG 7, and SDG 11	SDG3	7
	SDG4	5
	SDG7	24
	SDG11	9
Biosphere: SDG 6, SDG 13, SDG 14, and SDG 15	SDG6	7
	SDG13	14
	SDG14	6
	SDG15	9

As depicted in Table 2, the articles reviewed in this study were classified into five categories: the first is concerned with MCDM applications to the 2030 Agenda for Sustainable Development, the second refers to applications addressed to multiple SDGs issues, and the remaining categories follows a taxonomy proposed by Rockström and Sukhdev [33]. They are: (i) “Economy” (SDG 8, SDG 9, SDG 10, and SDG 12), (ii) “Society” (SDG 2, SDG 3, SDG 4, SDG7, and SDG 11), and (iii) “Biosphere” (SDG 6, SDG 13, SDG 14, and SDG 15).

Amongst the 143 selected articles, five refer to the 2030 Agenda framework as a whole, while 13 are addressed to problem-solving concerning more than one SDG, including two studies focusing on the water–energy–food nexus. In turn, 33 articles are classified into the “Economy” category, 56 into the “Society” category, and 36 into the “Biosphere” category. Individually, works related to SDG 7 (“Affordable and Clean Energy”) appear in the first position of the selected documents (17% of the articles), followed by SDG 9 (“Industry, Innovation, and Infrastructure”), and SDG 13 (“Climate Action”), both answer to 10%.

It is important to highlight that only four of all 17 SDGs had no work identified in the review process about MCDM applications within the 2030 Agenda framework (See search history in Appendix A). They are SDG 1 (“No poverty”), SDG 5 (“Gender Equality”), SDG 16 (“Peace, Justice, and Strong Institutions”), and SDG 17 (“Partnerships for the Goals”).

3.3. MCDM Methods Applied to the 2030 Agenda Framework

Table 3 presents the MCDM methods that were adopted in the reviewed articles. Accordingly, the most popular MCDM methods are the AHP method (73 articles), TOPSIS (31 articles), DEMATEL (13 articles), PROMETHEE (12 articles), and VIKOR (11 articles). Following the taxonomy proposed by Danesh et al. [34], these methods could be classified into: (i) utility-based (12 methods), (iii) compromise (10 methods), (ii) multi-objective decision-making (6 methods), (iii) outranking (3 methods), and (v) other MCDM methods (7 methods).

Table 3. MCDM methods applied to the 2030 Agenda framework.

MCDM Method	Ref.	Number of Articles		Classification [34]
		<i>n</i>	%	
AHP	[35]	73	51.05	Utility-based method
TOPSIS	[36]	31	21.68	Compromise method
DEMATEL	[37]	13	9.09	Other MCDM method
PROMETHEE	[38]	12	8.39	Outranking method
VIKOR	[39]	11	7.69	Compromise method
ANP	[40]	10	6.99	Utility-based method
ELECTRE	[41]	10	6.99	Outranking method
COPRAS	[42]	5	3.50	Compromise method
DEA	[43]	5	3.50	Multi-objective decision-making method
EDAS	[44]	5	3.50	Compromise method
GP	[45]	5	3.50	Multi-objective decision-making method
SAW	[46]	5	3.50	Compromise method
Remaining methods *	Various	<5 **	23.08	See notes below.

Notes: The abbreviations signify the following: AHP—Analytic Hierarchy Process; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; DEMATEL—Decision Making Trial and Evaluation Laboratory; PROMETHEE—Preference Ranking Organization Method for Enrichment of Evaluations; VIKOR—Vlekkriterijumsko KOMPromisno Rangiranje; ANP—Analytic Network Process; ELECTRE—Elimination et Choix Traduisant la Réalité; COPRAS—Complex Proportional Assessment; DEA—Data Envelopment Analysis; EDAS—Evaluation Based on Distance from Average Solution; GP—Goal Programming; SAW—Simple Additive Weighting. (*) The remaining 25 methods are: (i) Utility-based methods (MAUT, ARAS, CPP, DEX, IFPPSI, MOOSRA, SWARA, TODIM, and VF); (ii) Compromise methods (BMW, CODAS, ISWM, MABAC, and WSM); (iii) Multi-objective decision making methods (HSMAA, MOLP, NMOP, and BOD-MCDM); (iv) Outranking methods (SMAA); (v) Other MCDM methods (WASPAS, LBWA, MA, MAV, SMART, UTAUT). (**) Since there are 25 remaining methods, the number of articles < 5 means that fewer than five items adopted these methods.

Utility-based methods, also known as multi-attribute techniques, compensatory methods, or performance aggregation-based methods, aims to allocate a utility amount to every alternative, considering uncertainty and providing options for the alternatives to communicate with each other, like AHP, and ANP methods [34,35,40].

The compromise methods are an interactive MCDM approach that drivers by aggregating features that provide bonding to the ideal solution and a foundation for discussions concerning decision-making based on the factors' weight, like TOPSIS, VIKOR, COPRAS, EDAS, and SAW [34,36,39,42,44,46].

The multi-objective decision-making methods (e.g., DEA and GP) are also known as continuous methods or mathematical programming methods. They deal with various targets simultaneously without having a clear direction as to which refer to performances and which to issues by applying a mathematical optimization solver, expecting to optimize more than one objective function simultaneously [34,43,45].

The outranking methods, also known as partially compensatory or preference aggregation-based methods, evaluate a set of preferences to determine whether one option is at least as effective as another, like PROMETHEE and ELECTRE [34,38,41].

Finally, the last category, "Other MCDM methods" comprises discrete methods that cannot be categorized as utility-based, outranking, or compromise methods due to their complexities (for example, DEMATEL, WASPAS, LBWA, MA, MAV, SMART, UTAUT techniques) [34,37].

Figure 3 shows the distribution of the reviewed articles according to the taxonomy proposed by Danesh et al. [34].

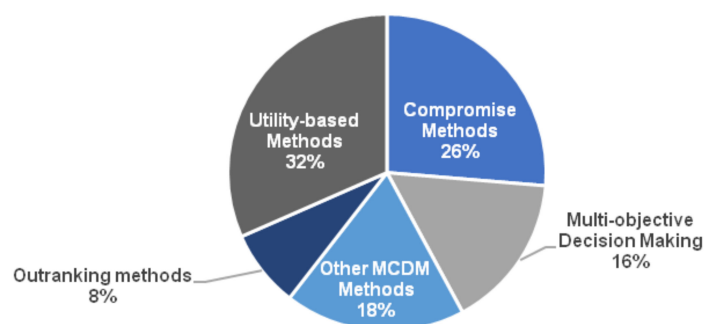


Figure 3. Distribution of the reviewed articles according to the taxonomy proposed by Danesh et al. [34].

As can be observed in Figure 3, utility-based methods lead the MCDM applications addressing the 2030 Agenda issues (32%), followed by compromise methods (26%) and other MCDM methods (18%).

3.4. MCDM Methodological Approaches

Figure 4 shows the distribution of the reviewed articles according to the adopted MCDM methodological approaches, i.e., application of single MCDM methods, integration of MCDM methods, combination of MCDM and non-MCDM methods, use of fuzzy set theory (FST) with MCDM methods, use of sensitivity analysis in MCDM results, and adoption of multi-stakeholder approaches and participatory mechanisms.

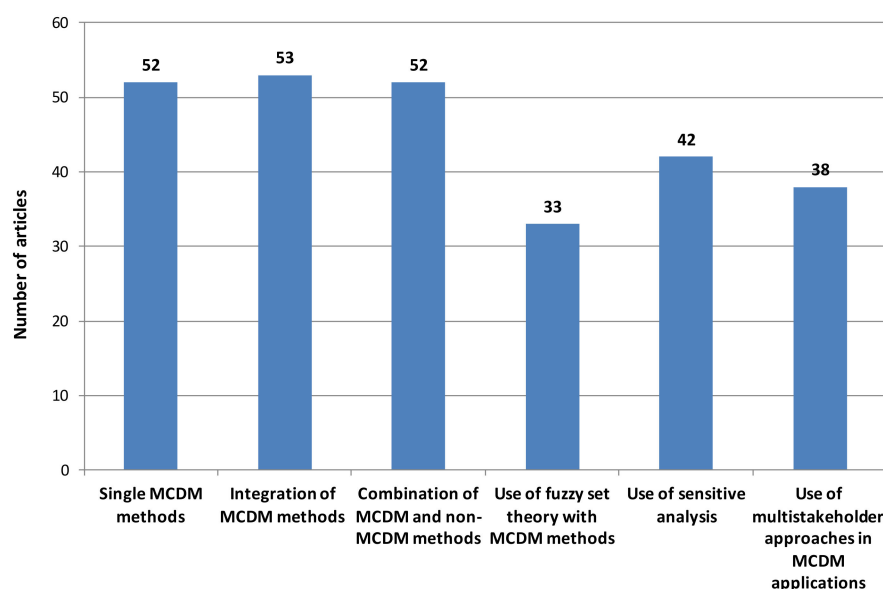


Figure 4. MCDM methodological approaches adopted in the reviewed articles. Note: More than one methodological MCDM approach can be adopted in one single article so that the sum of the methodological categories exceeds 143 articles.

The results shown in Figure 4 confirm the methodological trends observed in recent studies on MCDM applications for SD issues, besides the application of single MCDM methods [47–49].

Concerning the integration of MCDM methods, 53 articles used this approach. The most common is the hybrid AHP-TOPSIS approach. Another important hybrid MCDM approach refers to DEMATEL-ANP method. DEMATEL is used in more than 70% of the cases in which the ANP method is also employed.

With regard to the combination of MCDM and non-MCDM methods, this approach was adopted in 52 articles. Some examples include MCDM methods with SWOT analysis,

Delphi technique, Geographical Information Systems (GIS), and Artificial Intelligence (AI) algorithms. The most popular MCDM and non-MCDM combinations are those related to the AHP method with GIS.

Using sensitivity analysis in MCDM results can add further value to a given study because it allows decision-makers to judge whether the results are accurate and robust enough to decide [50]. Moreover, it provides a means for judging the stability of results when the parameter values are changed. Nevertheless, only 42 of the reviewed articles employed sensitivity analysis to improve the results' robustness.

It is important to highlight that MCDM methods cannot consider the ambiguity and vagueness of selecting, scoring, and weighting unless fuzzy set theory is combined with them to accommodate human judgments' subjectivity [51]. Analogously to the low use of sensitivity analysis, only 33 articles have incorporated fuzzy logic in their methodological approaches.

Finally, multi-stakeholder approaches and participatory mechanisms are intrinsically linked to decisions concerning the 2030 Agenda and the SDGs implementation [52,53]. Based on this assumption, 38 articles adopted this approach associated with MCDM applications addressed to decision problems within the 2030 Agenda framework.

3.5. Contexts of MCDM Applications

Figure 5 shows the distribution of the reviewed articles according to the contexts of MCDM applications.

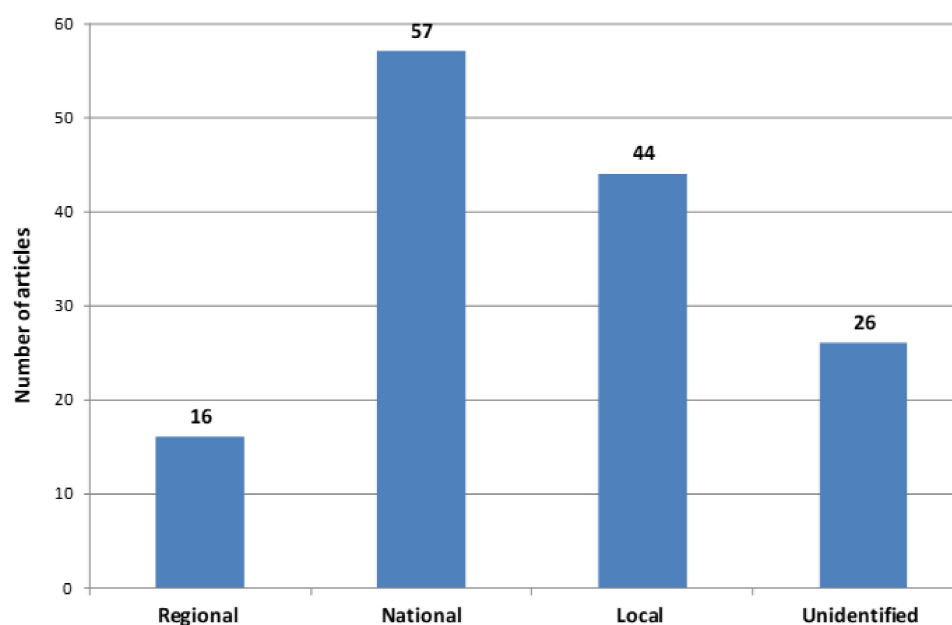


Figure 5. Contexts of the MCDM applications within the 2030 Agenda framework. Note: All 26 articles classified in the 'unidentified context' category refer to generic MCDM frameworks that can be applied in different contexts.

One can observe that national contexts lead the reviewed articles with 40% of the total, followed by local contexts answering 31% of the selected articles. Local contexts refer to districts, municipalities, states, provinces, villages, or any other subdivision within a country.

The regional contexts account for 11% of the articles, focusing on SDGs issues in regional blocs (for example, European Community, for example) or any other regional groupings. Finally, it is relevant to mention that although it was not possible to identify the MCDM application context (if in a region, country, or municipality) in 26 articles, they refer to generic decision frameworks focusing on SDGs that can be applied in different contexts.

Focusing on the reviewed articles that applied MCDM methods in national contexts, Figure 6 shows the distribution of these articles according to the countries where the studies were conducted.

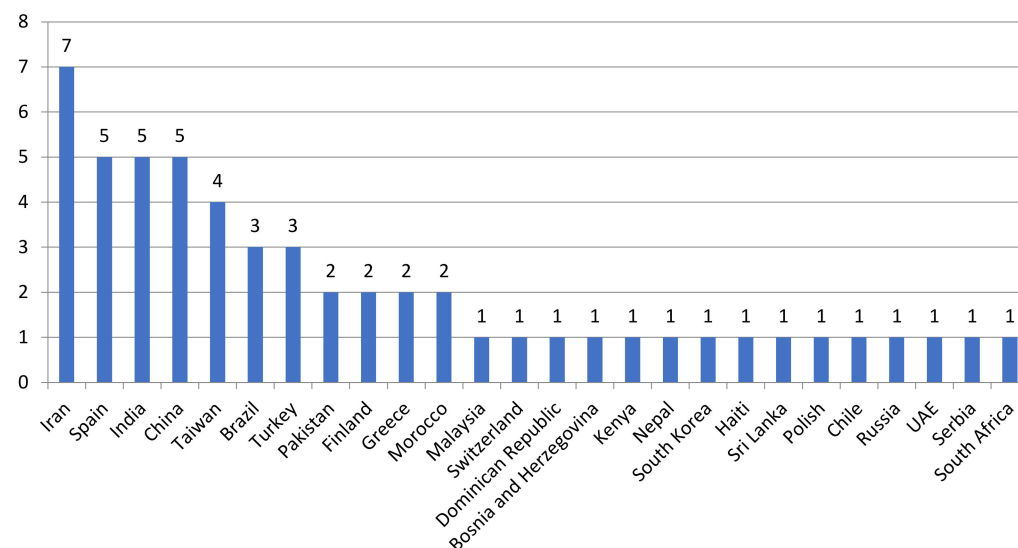


Figure 6. MCDM applications in national contexts within the 2030 Agenda framework.

The largest number of articles concerned with SDGs issues in national contexts are in Iran (7 studies), followed by Spain, India, and China (5 each), Taiwan (4 each), and Brazil and Turkey (3 each).

Local contexts of MCDM applications stand for any country subset, e.g., districts, municipalities, states, provinces, and villages. These studies are even more granulated than those concerning national contexts. The most significant number of local studies refer to India (8 articles), followed by Iran (6), China (4), Spain and Turkey (3 each), and then Saudi Arabia (2).

3.6. Sources of the Reviewed Articles

Table 4 presents the top 5 scientific journals and the total citations of the 41 reviewed articles published in these journals. Sustainability (MDPI Publisher) stands out among the main sources, followed by the Journal of Cleaner Production (Elsevier Publisher). They are followed by the Water Resources Management (Springer Publisher), the Sustainable Cities and Society, and Sustainable Cities and Society (Elsevier Publisher).

Table 4. Main sources of the reviewed studies.

Source	Publisher	Number of Articles	Total Citations
Sustainability (Switzerland)	MDPI	24	121
Journal of Cleaner Production	Elsevier	7	181
Water Resources Management	Springer	4	16
Sustainable Cities and Society	Elsevier	3	39
Renewable and Sustainable Energy Reviews	Elsevier	3	21

Notwithstanding the fact that the top 3 journals are responsible for 24% of the total (143 articles), they are accountable for more than 37% of the total citations, demonstrating their relevance in the research field of MCDM applications concerning the 2030 Agenda framework.

4. In-Depth Analyses of the Literature: Results and Discussion

Even though many MCDM methods are available, decision-makers have been facing difficulties in selecting the best MCDM methodological approach to elaborate relevant answers addressed to the posed decision questions [54]. In this review, an attempt was made to summarize the main MCDM methodological approaches and discuss how MCDM methods helped decision-makers solve multidimensional problems in achieving the SDGs in different application contexts.

Based on Roy (1996) [54], decision-makers may formulate the MCDM problems in four different ways, as follows:

- Choice: MCDM is used to select the best option from a set of alternatives;
- Sorting: MCDM is employed to assign a set of alternatives to the categories that have been designed a priori;
- Ranking: MCDM is applied to order the alternatives wholly or partially;
- Description: MCDM is used to define the alternatives, build a set of criteria and determine the performance of all or some alternatives taking into account additional information.

The papers reviewed in this study are classified into five categories: (i) The 2030 Agenda for Sustainable Development; (ii) Multiple SDGs; (iii) Economy (SDG 8, SDG 9, SDG 10, and SDG 12); (iv) Society (SDG 2, SDG 3, SDG 4, SDG 7, and SDG 11), and (v) Biosphere (SDG 6, SDG 13, SDG 14, and SDG 15). As mentioned in the introductory section, only four SDGs had no work identified in the review process. They are: SDG 1 (“No Poverty”), SDG 5 (“Gender Equality”), SDG 16 (“Peace, Justice, and Strong Institutions”), and SDG 17 (“Partnerships for the Goals”).

In some cases, the articles showed the potential to fall into several categories. Nevertheless, an attempt was made to select the best category according to each article’s main issues and decision objectives. Due to the large number of articles, all the papers identified in each category are presented in separate tables in chronological order.

4.1. The 2030 Agenda for Sustainable Development

A fundamental issue in implementing the UN 2030 Agenda in different contexts is the systemic analysis of global targets’ interactions, considering the context-specific understanding of these interactions within a long-term vision. Another critical issue is how to apply and combine MCDM approaches to provide a consistent analysis for evidence-based decision-making on the SDGs and respective global targets.

Table 5 synthesizes the reviewed articles’ findings and the MCDM contributions related to this category [55–59].

Karaşan and Kahraman [55] developed and applied an Interval-Valued Neutrosophic EDAS method to choose the SDGs that Turkey should start to invest in the context of the national 2030 Agenda. An expert group determined the criteria and alternatives, assigned weights to the criteria, and prioritize the SDGs that should integrate the country’s 2030 Agenda. Oliveira et al. [56] proposed a systemic and contextual framework to prioritize SDG targets for the Brazilian 2030 Agenda by integrating two fuzzy MCDM methods (fuzzy AHP and fuzzy TOPSIS), prospective structural analysis (PSA), and network theory tools. The applicability of the proposed framework could be demonstrated through a socio-technical experiment carried out by local stakeholders during 2018 to define the Brazilian 2030 Agenda. Resce and Schiltz [57] developed a MCDM approach to evaluate European countries’ performance on SDGs’ achievement by employing the Hierarchical Stochastic Multicriteria Acceptability Analysis (HSMAA) and using data from Eurostat database. The results showed that Denmark outperforms other European countries, while lower performance levels were observed in Romania and Bulgaria.

Table 5. Articles reviewed in “The 2030 Agenda for Sustainable Development” category.

Author(s)	Method(s)	Methodological Approach	Context of Application
Karaşan and Kahraman (2018) [55]	IVN EDAS	Single MCDM.	National (Turkey)
Oliveira et al. (2019) [56]	Fuzzy AHP + Fuzzy TOPSIS + PSA + network analysis.	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	National (Brazil)
Resce and Schiltz (2020) [57]	HSMAA	Single MCDM.	Regional (EU)
Breu et al. (2020) [58]	AHP + PSA + network analysis.	Combination of MCDM and non-MCDM methods.	National (Switzerland)
Benítez and Liern (2020) [59]	Unweighted TOPSIS	Single MCDM. Case studies.	National (country unidentified)

Note: The abbreviations signify the following: IVN EDAS—Interval-Valued Neutrosophic Evaluation Based on Distance from Average Solution; AHP—Analytic Hierarchy Process; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; HSMAA—Hierarchical Stochastic Multicriteria Acceptability Analysis; PSA—Prospective Structural Analysis.

Focusing on the case of Switzerland, Breu et al. [58] tested and enhanced existing approaches for assessing interactions among the 2030 Agenda’s targets and for analyzing the systemic relevance of priority targets. With participation of local stakeholders, they established a cross-impact matrix for Switzerland’s priority targets and applied a network analysis, including a prospective structural analysis (PSA) for understanding the systemic impact of targets, establishing an order of priority for policy actions on the SDGs in Switzerland. The contribution by Benítez and Liern [59] refers to the usefulness of a new TOPSIS version, called unweighted TOPSIS (uwTOPSIS), for eliminating the problem of weighting sustainability criteria for ranking alternatives concerning SDGs.

By reviewing the articles classified in this first category, it became apparent that the combination of MCDM methods with non-MCDM methods could improve the flexibility and accuracy of decisions concerning the prioritization of SDGs’ targets to be included in a country’s 2030 Agenda [56,58]. Besides, fuzzy logic, combined with MCDM methods, helped decision-makers weighting criteria and prioritize targets under uncertainty [56]. Finally, three other MCDM methods (IVN EDAS, HSMAA, and uwTOPSIS) were employed to define criteria and prioritize SDGs targets to be integrated into 2030 Agendas in national or regional contexts [55,57,59].

4.2. Multiple Sustainable Development Goals

Table 6 summarizes the papers reviewed in this category, highlighting the methodological approaches and contexts of application of MCDM methods [60–72].

The multiple interlinkages between SDGs and global targets within the 2030 Agenda framework point out that integrated and synergistic implementation would benefit different contexts (regional, national, or local). From this perspective, several selected articles addressed applications of MCDM methods by adopting the nexus approach for the SDGs implementation.

Focusing on three SDGs’ issues (SDG 7, SDG 9, and SDG 11), Jayaraman et al. [60] used Goal Programming (GP) to prioritize resource mobilization for energy efficiency, diversified electricity generation, and new modes of transportation for the United Arab Emirates (UAE). Regarding SDG11 and SDG 13, Mukherjee et al. [61] employed fuzzy TOPSIS to rank and select sustainable transportation systems in Delhi (India), with linguistic ratings to the potential alternatives against the selected criteria. Concerning six key areas associated with SDGs 4, 5, and 17, Monsonís-Payá et al. [62] applied the AHP method to provide tools for policy- and decision-makers in Europe regarding these areas (governance, public engagement, gender equality, science education, and open science and ethics).

Table 6. Articles reviewed in the “Multiple Sustainable Development Goals” category.

Author(s)	Method(s)	Methodological Approach	Context of Application
Jayaraman et al. (2016) [60]	GP	Single MCDM.	National (UAE)
Mukherjee et al. (2017) [61]	Fuzzy TOPSIS	Single MCDM. Use of fuzzy logic.	Local (Delhi, India)
Monsonís-Payá et al. (2017) [62]	AHP	Single MCDM.	Regional (Europe)
Karabulut et al. (2019) [63]	TOPSIS + correlation analysis + scenario planning	Combination of MCDM and non-MCDM methods.	Regional (Mediterranean region)
Mostafaeipour and Sadeghi (2019) [64]	Fuzzy AHP + TODIM + SAW + TOPSIS + VIKOR + sensitivity analysis	Integration of MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	National (Iran)
De and Majumder (2019) [65]	AHP + BFOA + FA	Integration of MCDM methods Combination of MCDM and non-MCDM methods. Use of artificial intelligence.	National (India)
Llorente-Marrón et al. (2020) [66]	TOPSIS + DID	Combination of MCDM and non-MCDM methods.	National (Haiti)
Pamučar et al. (2020) [67]	LBWA + WASPAS + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	National (Iran)
Munasinghe-Arachchige et al. (2020) [68]	PROMETHEE + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Unidentified
Zamani et al. (2020) [69]	Fuzzy TOPSIS + Fuzzy PROMETHEE II	Integration of MCDM methods. Use of fuzzy logic.	Local (Jarreh, Iran)
Kumar et al. (2020) [70]	Fuzzy TOPSIS	Single MCDM. Use of fuzzy logic.	Unidentified
Radmehr et al. (2020) [71]	TOPSIS + NMOP	Integration of MCDM methods.	National (Iran)
Das et al. (2020) [72]	MOLP	Single MCDM.	Local (Eastern India)

Note: The abbreviations signify the following: GP—Goal Programming; fuzzy TOPSIS—fuzzy Technique for Order Preference by Similarity to Ideal Solution; AHP—Analytic Hierarchy Process; TODIM—Tomada de Decisão Interativa Multicritério; SAW—Simple Additive Weighting; VIKOR—Vlekrterijumsko KOMPromisno Rangiranje; BFOA—Bacterial Foraging Optimization Algorithm; FA—Firefly Algorithm; DID—Differences in Differences; LBWA—Level Based Weight Assessment; WASPAS—Weighted Aggregated Sum Product Assessment; PROMETHEE—Preference Ranking Organization Method for Enrichment of Evaluations; NMOP—Nonlinear Multi-Objective Optimization; MOLP—Multi-Objective Linear Programming.

Three studies investigated the coherence among sectoral policies and selected measures for managing the water-energy-food nexus in different contexts, namely: local (Eastern India) [72], national (Iran) [71], and regional (The Mediterranean region in Europe) [63]. Two of them combined MCDM and non-MCDM methods [63,71] while [72] used MOLP to evaluate nexus-sustainability and conventional approaches for optimal water-energy-land-crop planning in an irrigated canal command in Eastern India.

In this category, most of the studies adopted compromise methods (TOPSIS and VIKOR, for example) [61,63,64,66,69–71], whereas three employed a utility-based method (AHP) [62,64,65], two applied an outranking method (PROMETHEE) [68,69], and the remaining studies [60,67,71,72] used multi-objective methods (e.g., GP and MOLP). Finally, it should be emphasized that four studies [61,64,69,70] combined fuzzy logic with MCDM methods, and one of them [65] employed artificial intelligence algorithms (i.e., Bacterial Foraging Optimization Algorithm and the Firefly Algorithm) to optimize objective functions for the intelligent allocation of energy to different contributors to surface water treatment plants in India.

The next sections refer to 13 single SDGs, classified according to Rockström and Sukhdev’s taxonomy [33]. The findings concerning the three categories below are presented and discussed:

- Economy: SDG 8, SDG 9, SDG 10, and SDG 12;
- Society: SDG 2, SDG 3, SDG 4, SDG 7, and SDG 11;
- Biosphere: SDG 6, SDG 13, SDG 14, and SDG 15.

4.3. Economy: SDG 8, SDG 9, SDG 10, and SDG 12

The contributions of MCDM methods for the achievement of the SDGs in this category are pointed out in 33 studies, as follows: SDG 8—Decent Work and Economic

Growth' [73–78], SDG 9–'Industry, Innovation and Infrastructure' [79–93], SDG 10–'Reduced Inequalities' [94,95], and SDG 12–'Responsible Consumption and Production' [96–105].

4.3.1. SDG 8: Decent Work and Economic Growth

Table 7 summarizes the reviewed papers related to SDG 8 [69–74], highlighting the methods, methodological approaches, and contexts of the MCDM applications.

Table 7. Articles reviewed concerning "SDG 8: Decent Work and Economic Growth".

Author(s)	Method(s)	Methodological Approach	Context of Application
Michailidou et al. (2016) [73]	ELECTRE III + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	National (Greece)
Jafari-Moghadam et al. (2017) [74]	DEMATEL + ANP	Integration of MCDM methods.	National (Iran)
Suganthi (2018) [75]	Fuzzy AHP + VIKOR + DEA	Integration of MCDM methods. Use of fuzzy logic.	National (unidentified country)
Sitaridis and Kitsios (2020) [76]	PROMETHEE II + TOPSIS + Non-weighted method	Integration of MCDM methods.	National (Greece)
Norese et al. (2020) [77]	ELECTRE II	Single MCDM.	National (South Africa)
Prevolšek et al. (2020) [78]	DEX	Single MCDM.	National (Bosnia and Herzegovina)
Das et al.(2020) [72]	MOLP	Single MCDM.	Local (Eastern India)

Note: The abbreviations signify the following: ELECTRE III—Elimination et Choix Traduisant la Réalité III; DEMATEL—Decision Making Trial and Evaluation Laboratory; ANP—Analytic Network Process; fuzzy AHP—fuzzy Analytic Hierarchy Process; VIKOR—Viekrriterijumsko KOMPromisno Rangiranje; DEA—Data Envelopment Analysis; PROMETHEE II—Preference Ranking Organization Method for Enrichment of Evaluations; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; DEX—Decision Expert.

Most articles focused on decision problems concerning tourism activities [73,74,78] or multisectoral areas [75,76]. Michailidou et al. (2016) [73] used ELECTRE III and sensitivity analysis to rank options for mitigating emissions and adapting tourism businesses and destinations to Greece's changing climate conditions. Jafari-Moghadam et al. (2017) [74] employed a hybrid DEMATEL- ANP method to weigh and prioritize entrepreneurship policy dimensions by tourism entrepreneurs, tourism policymakers, and experts. Prevolšek et al. (2020) [78] used a multi attribute DEX approach for assessing ethno-villages in Bosnia and Herzegovina based on sustainability criteria and subcriteria.

Sitaridis and Kitsios [76] use and compare the applicability of an outranking method (PROMETHEE II), together with TOPSIS and a non-weighted MCDM, to evaluate entrepreneurial ecosystems (EEs) in Greece according to the Global Entrepreneurship Monitor (GEM) framework. Only one study integrated fuzzy set theory to a MCDM approach [75]. In this study, Suganthi [75] proposed a thorough model to assess the effectiveness of sectoral investments made by a nation for achieving sustainable development. The author integrated fuzzy AHP to determine the weights of a set of sustainability criteria, fuzzy VIKOR to rate the various sectors based on the importance of sustainability criteria. In contrast, DEA was used to determine whether the sectoral investments are appropriately budgeted and how they can be improved for sustainable development and economic growth.

According to the MCDM taxonomy used in this review [34], three utility-based methods (ANP, AHP, and DEX) were applied in [74,75,78], respectively. Two compromise methods (VIKOR and TOPSIS) were used in [75,76]. Outranking MCDM methods (ELECTRE II and III, and PROMETHEE II) were employed in [73,76,77], and a multi-objective method (DEA) was used in [75] integrated with fuzzy AHP and VIKOR methods.

4.3.2. SDG 9: Industry, Innovation, and Infrastructure

A summary of the reviewed papers related to SDG 9 issues [79–93] is presented in Table 8.

Table 8. Articles reviewed concerning “SDG 9: Industry, Innovation, and Infrastructure”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Stosic et al. (2016) [79]	AHP	Single MCDM.	Unidentified
Wang et al. (2018) [80]	GPCA	Single MCDM.	National (China)
Lee et al. (2018) [81]	ANP + DEMATEL + ZOGP	Integration of MCDM methods.	National (Taiwan)
Yang et al. (2018) [82]	DEMATEL + ANP + VIKOR	Integration of MCDM methods.	National (China)
Hung et al. (2019) [83]	DEA based on the slacks-based measure (SBM) + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	National (Taiwan)
Sansabas-Villalpando et al. (2019) [84]	Fuzzy CODAS + fuzzy AHP + sensitivity analysis	Integration of MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	Unidentified
Lee et al. (2020) [85]	DEA + VIKOR	Combination of MCDM and non-MCDM methods.	National (Taiwan)
Ovezikoglou et al. 2020) [86]	ELECTRE III + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Unidentified
Gupta et al. (2020) [87]	BWM	Single MCDM.	National (India)
Asees Awan and Ali (2019) [88]	Fuzzy VIKOR + GRA + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of artificial intelligence. Use of sensitivity analysis.	Regional (China-Pakistan Economic Corridor)
Yang and Wang (2020) [89]	Fuzzy AHP + fuzzy TOPSIS + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	National (China)
Turskis et al. (2020) [90]	AHP + fuzzy WASPAS + WSM	Integration of MCDM methods. Use of fuzzy logic.	Regional (Europe)
Stoilova et al. (2020) [91]	ANP + Hierarchical Cluster Analysis + K-Means Cluster Analysis + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Regional (Europe)
Soares et al. (2020) [92]	Fuzzy SAW	Single MCDM. Use of fuzzy logic.	National (Brazil)
Lai et al. (2020) [93]	Fuzzy Z- DNMA + Z-TOPSIS + Z-VIKOR + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	Unidentified

Note: The abbreviations signify the following: AHP—Analytic Hierarchy Process; GPCA—Global Principal Component Analysis; ANP—Analytic Network Process; DEMATEL—Decision Making Trial and Evaluation Laboratory; ZOGP—Zero-One Goal Programming; VIKOR—Vlekkriterijumsko KOMPromisno Rangiranje; SBM-DEA—Slacks-Based Measure-Data Envelopment Analysis; fuzzy CODAS—fuzzy Combinative Distance-based Assessment; ELECTRE III—Elimination et Choix Traduisant la Réalité III; BWM—Best-Worst Method; GRA—Grey Relational Analysis; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; fuzzy WASPAS—fuzzy Weighted Aggregated Sum Product Assessment; Fuzzy SAW—fuzzy Simple Additive Weighting; Fuzzy Z-DNMA—fuzzy Z-number-based Double Normalization-based Multiple Aggregation; Z-TOPSIS—Z-number-based Technique for Order Preference by Similarity to Ideal Solution; Z-VIKOR—Z-number-based Vlekkriterijumsko KOMPromisno Rangiranje.

In most articles concerning SDG 9, MCDM approaches were applied to evaluate the industry’s sustainability performance in national contexts to overcome barriers to achieve this SDG [80,81,84,85,87,89]. By way of illustration, Wang et al. [80] used Grey Principal Component Analysis (GPCA) to assess the industrial sector under the pressure of climate change adaptation and mitigation in China’s Capital Economic Circle. Lee et al. [81] integrated three MCDM methods (ANP, DEMATEL, and ZOGP) to choose strategic options addressed to green aviation fleet management in Taiwan. Their evaluation showed that the proposed mixed strategy portfolio for green aviation fleet management could be determined using limited resources. Some authors concentrated their efforts on selecting or ranking strategies to make the infrastructure sector more sustainable [81,87,89–94].

Regarding the integration of MCDM methods, this approach was adopted in six studies [79,82,84,85,90,95]. For example, based on a four-dimensional service innovation model, Yang et al. [82] integrated DEMATEL, ANP, and VIKOR to select technological innovations for service-orientated enterprises in China. In relation to hybrid approaches combining MCDM and non-MCDM methods, Stoilova et al. [91] combined an MCDM method (ANP) with non-MCDM methods (Hierarchical Cluster Analysis and K-Means Cluster Analysis) to investigate infrastructural development strategy for the regions connected through the axis of TEN-T railway corridor Genoa–Rotterdam, taking into account the following criteria: economic development, spatial development, rail operation, environment, and logistics.

Aligned with the MCDM taxonomy chosen for this review, eight studies employed compromise methods, namely VIKOR, CODAS, TOPSIS, BWM, and SAW studies [82,84,85,87–89,92,93]. Two utility-based methods were applied in seven studies, as follows: AHP [79,84,89,90], and ANP [81,82,91]. Multi-objective methods were used in three studies, namely ZOGP [81] and DEA [83,85]. An outranking method (i.e., ELECTRE III) was applied by Ovezikoglou et al. [86] for selecting environmental indicators to be applied to industrial investment evaluation. Thus, 18 scenarios were built and ranked as alternatives, based on relevant data from the literature and taking into account the principles of prevention, planning, and design. Finally, it is important to mention that six studies [84,88–90,92,93] combined fuzzy logic with MCDM methods, and one [88] used artificial intelligence (i.e., GRA) to select and rank the best sustainable reverse logistics recovery options, focusing on the case of China Pakistan Economic Corridor (CPEC).

4.3.3. SDG 10: Reduced Inequalities

Table 9 presents the contributions of MCDM methods related to this category [94,95].

Table 9. Articles reviewed concerning “SDG 10: Reduced Inequalities”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Labella et al. (2020) [94]	AHPSort II	Single MCDM.	Regional (Europe)
Sant’Anna et al. (2020) [95]	CPP + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Regional (Some countries)

Note: The abbreviations signify the following: AHPSort II—Analytic Hierarchy Process Sort; CPP—Composition of Probabilistic Preferences.

Labella et al. [94] developed a novel approach to evaluate the inequalities in the European Union (EU) countries based on a compromise method (AHPSort II). This methodological approach allowed the authors to obtain a classification of the EU countries according to their achievements in reducing inequalities to subsequently carry out an in-depth performance analysis to conclude as to the evolution of inequality in them over the years.

In turn, Sant’Anna et al. [95] used a utility-based method (Composition of Probabilistic Preferences or CPP) to generate human development indices with a variable number of components. They developed and calculating indices combining eight components, four of which address different dimensions of inequality. As posed by the authors, the main advantage of this approach is its systematic nature, which facilitated the addition of new dimensions, more components in each direction, and more types of component measurements.

4.3.4. SDG 12: Responsible Consumption and Production

Table 10 summarizes the articles reviewed in this category and the contributions of MCDM methods for achieving SDG 12 [96–105].

Four studies employed MCDM methods aiming to prioritize viable alternatives concerning responsible consumption and production [97,102,104,105]. For illustrative purposes, Mangla et al. [97] applied fuzzy AHP and sensitivity analysis to identify barriers to SDG 12 achievement and prioritize alternatives concerning sustainable consumption and production trends in a supply-chain context. Other studies prioritized waste disposal options [105], materials to be recycled [104], and sanitary landfill sites to be mapped [102].

In two articles, their authors ranked the risks to be mitigated in chemical plants [96] and cotton manufacturing [103]. In [99], an aggregate indicator of a regional green economy was proposed and applied using the TOPSIS method to assess the level of the green economy in Polish regions and its changes in the period 2004–2016.

Table 10. Articles reviewed concerning “SDG 12: Responsible Consumption and Production”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Khakzad and Reniers (2016) [96]	AHP + Bayesian Network (BN)	Combination of MCDM and non-MCDM methods. Use of artificial intelligence.	Unidentified
Mangla et al. (2018) [97]	Fuzzy AHP + sensitivity analysis	Single MCDM. Use of sensitivity analysis. Use of fuzzy logic.	Unidentified
Eikelboom et al. (2018) [98]	AHP + Delphi technique	Combination of MCDM and non-MCDM methods.	Unidentified
Godlewska et al. (2019) [99]	TOPSIS	Single MCDM.	National (Polish)
Bhatia et al. (2019) [100]	Fuzzy TOPSIS + fuzzy GRA + fuzzy VIKOR + sensitivity analysis	Integration of MCDM methods. Use of artificial intelligence. Use of fuzzy logic. Use of sensitivity analysis.	National (India)
Schlickmann et al. (2020) [101]	AHP	Single MCDM.	Unidentified
Cobos Mora and Solano Peláez (2020) [102]	AHP + GIS	Combination of MCDM and non-MCDM methods.	Local (Azuay, Ecuador)
Bhalaji et al. (2020) [103]	Fuzzy DEMATEL + ANP + PROMETHEE	Integration of MCDM methods. Use of fuzzy logic.	National (India)
Bose et al. (2020) [104]	ARAS + MABAC + COPRAS + MOOSRA	Integration of MCDM methods.	Unidentified
Chauhan et al. (2020) [105]	DEMATEL	Single MCDM.	Local (Dehradun, Saharanpur, and Moradabad, India)

Note: The abbreviations signify the following: AHP—Analytic Hierarchy Process; BN—Bayesian Network; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; Fuzzy GRA—Grey Relational Analysis; fuzzy VIKOR—fuzzy Vlekraterijumsko KOM-promisno Rangiranje; GIS—Geographical Information System; fuzzy DEMATEL—Decision Making Trial and Evaluation Laboratory; ANP—Analytic Network Process; PROMETHEE—Preference Ranking Organization Method for Enrichment of Evaluations; ARAS—Additive Ratio Assessment; MABAC—Multi-Attributive Border Approximation area Comparison; COPRAS—Complex Proportional Assessment; MOOSRA—Multi-Objective Optimization by Simple Ratio Analysis.

In respect to MCDM methods’ integration, three studies adopted this methodological approach [100,103,104]. For instance, Bhatia et al. [100] integrated fuzzy TOPSIS, fuzzy GRA, and fuzzy VIKOR methods to decide the appropriate location to establish the remanufacturing facilities in the reverse supply chain. Several conflicting criteria were considered before establishing a remanufacturing facility. MCDM and non-MCDM methods were combined in three studies to support decisions concerning responsible consumption and production issues [96,98,102].

Concerning the MCDM taxonomy adopted in this review [34], most of the MCDM methods employed are utility-based methods, namely AHP [96–98,101,102] and ANP [103]. For example, Khakzad and Reniers [96] combined the AHP method with Bayesian Network (BN) to find an optimal layout for chemical plants by taking safety measures and land using planning regulations.

The remaining studies employed MOOSRA (a multi-objective method) [104], PROMETHEE (an outranking method) [103], and DEMATEL [103,105]. Considered an effective method for identifying cause-effect relationships of a complex system, DEMATEL deals with evaluating interdependent relationships among factors and finding the critical ones through a visual structural model. Amongst the MCDM methods applied in the reviewed 143 studies, DEMATEL appeared in the third position (13 articles) (See Table 3).

Finally, four studies can be highlighted regarding the use of fuzzy logic and artificial intelligence combined with MCDM methods. Three used fuzzy logic with AHP, TOPSIS, and VIKOR: fuzzy AHP [97], fuzzy TOPSIS, and fuzzy VIKOR [100]. Two works [96,100] employed artificial intelligence (i.e., Bayesian Network and GRA).

4.4. Society: SDG 2, SDG 3, SDG 4, SDG 7, and SDG 11

The contributions of MCDM methods for the achievement of SDGs belonging to this category are highlighted in 56 studies, as follows: SDG 2—“Zero Hunger and Sustainable Agriculture” [106–116], SDG 3—“Good Health and Well-being” [117–123], SDG 4—“Inclusive and Quality Education” [124–128], SDG 7—“Affordable and Clean Energy” [129–152], and SDG 11—“Sustainable Cities and Communities” [153–161].

4.4.1. SDG2: Zero Hunger and Sustainable Agriculture

Table 11 contains a summary of the reviewed articles related to this category [106–116].

Table 11. Articles reviewed concerning “SDG 2: Zero Hunger and Sustainable Agriculture”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Fagioli et al. (2017) [106]	ELECTRE III	Single MCDM.	Regional (European Community countries)
Emami et al. (2018) [107]	AHP + TOPSIS + SWOT analysis	Integration of MCDM methods. Combination of MCDM and non-MCDM methods.	National (Iran)
Jamil et al. (2018) [108]	Fuzzy AHP + GIS	Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	Local (Bijnor, India)
Aldababseh et al. (2018) [109]	AHP +GIS + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Local (Emirate Abu Dabi, UAE)
Ujoh et al. (2019) [110]	AHP +GIS	Combination of MCDM and non-MCDM methods.	Local (Benue, Nigeria)
Deepa et al. (2019) [111]	MIW + AHP + CRITIC + COPRAS + SAW	Integration of MCDM methods. Combination of MCDM and non-MCDM methods.	Local (Taiwan)
Movarej et al. (2019) [112]	ANP	Single MCDM.	National (Iran)
Banaeian and Pourhejazy (2020) [113]	Delphi technique + AHP + fuzzy TOPSIS	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	Local (Guilan, Iran)
Sari et al. (2020) [114]	AHP + PROMETHEE	Integration of MCDM methods.	Local (Konya, Turkey)
Puertas et al. (2020) [115]	TOPSIS + ELECTRE + CE	Integration of MCDM methods.	Regional (Europe)
Zandi et al. (2020) [116]	Fuzzy AHP + fuzzy TOPSIS + FMEA + sensitivity analysis	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	Unidentified

Note: The abbreviations signify the following: ELECTRE III—Elimination et Choix Traduisant la Réalité III; SWOT—Strengths, Weaknesses, Opportunities, and Threats; AHP—Analytic Hierarchy Process; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; GIS—Geographical Information System; MIW—Modified Integrated Weighting; CRITIC—Criteria Importance Through Intercriteria Correlation; COPRAS—Complex Proportional Assessment; SAW—Simple Additive Weighting; PROMETHEE—Preference Ranking Organization Method for Enrichment of Evaluations; CE—Cross-Efficiency; FMEA—Failure Mode and Effects Analysis.

In three studies [108–110], their authors combined a utility-based method (AHP) with Geographical Information Systems (GIS) in different localities, namely Bijnor (India), Emirate Abu Dhabi (UAE), and Benue (Nigeria), to access cropland suitability for choosing the best area for a specific crop and the areas where effective management is required.

Considering the prioritization of harvesting or mechanization technologies [107,113], the authors used AHP and TOPSIS, combined with other methods (e.g., SWOT analysis and Delphi technique). In all these cases, they aimed to achieve food security with their strategies. Furthermore, Zandi et al. [116] used a set of MCDM methods to rank risks in agriculture activities, indicating the most critical, namely water supply, energy supply, climate fluctuations, and pests.

Two studies [106,112] used single MCDM methods (ANP and ELECTRE III). In the first study, Fagioli et al. [106] applied an outranking method (ELECTRE III) in a regional context (European Community countries) to assess the level of multi-functionality along the entire food value chain in Europe. Initially, a set of indicators was defined to measure the level of multi-functionality of agrifood systems. Then, ELECTRE III was used to implement

an evaluation process by assigning specific importance to each indicator. The second study was developed in a national context (Iran). Movarej et al. [112] used the Analytic Network Process (ANP) to analyze interventions affecting the development of nutrition-sensitive agriculture production in this country.

In an attempt to integrate sustainability criteria into the machinery selection decisions in the agriculture sector in Guilan (Iran), Banaeian and Pourhejazy [113] combined Delphi technique with two MCDM methods and fuzzy logic (AHP and fuzzy TOPSIS). Besides, two more studies also applied fuzzy logic [108,113,116] combined with MCDM and non-MCDM methods (FMEA, for example). Emami et al. (2018) [107] used a SWOT analysis technique to identify key internal and external factors that affect the development of agricultural mechanization in Iran. These factors were then weighted using a utility-based method (AHP), and the mechanization strategies were prioritized employing a compromise method (TOPSIS).

In summary, most of the studies reviewed in this category employed utility-based methods (AHP and ANP) [107–114,116], followed by compromise methods (TOPSIS, CO-PRAS, SAW) [105,111,113,115,116], and outranking methods (ELECTRE III, PROMETHEE, and ELECTRE) [106,114,115].

4.4.2. SDG3: Good Health and Well-being

A summary of the MCDM methods applied in this category is presented in Table 12 [117–123].

To evaluate alternative mobile health care and determine the best option for satisfying the aspirations of consumers, two studies [119,120] employed hybrid MCDM approaches in different contexts of application (mobile health care in China and Spain). In both studies, DEMATEL was chosen for its effectiveness in identifying cause-effect chain components of complex systems. It helps to evaluate interdependent relationships among factors and finding the critical ones through a visual structural model. Moreover, Kolvir et al. [121] combine MCDM methods (TOPSIS and SAW, for example) with artificial intelligence tools (HANN and ANFIS) for improving the predictive accuracy of their assessments in Central Iran. In a different context (Russia), Trubnikov et al. [122] also combined an MCDM method (AHP) with an artificial intelligence algorithm (Random Forest algorithm). In turn, Halder et al. [123] used the AHP method with GIS to assess hospital sites' suitability in Rajpur-Sonarpur (India) by spatial information technologies.

To sum up, most of the studies reviewed in this category integrated MCDM methods [117,119,121,122], and three combined MCDM with non-MCDM methods [119,121,123]. According to the MCDM taxonomy used in this review, two utility-based methods (AHP and ANP) were applied in [117,119,122,123], and compromise methods were used in [117,119,120].

Since data analyzed in the contexts of good health, safety, and well-being should have maximum accuracy, artificial intelligence algorithms (e.g., Random Forest, HANN, and ANFIS) and fuzzy logic combined with MCDM methods were used in three studies [117,121,122]. Hu and Tzeng [117] integrated fuzzy DEMATEL, fuzzy ANP, and fuzzy VIKOR to create strategies addressed to continuous improvement and sustainable development. Their analysis was based on the performance of the dimensions and criteria associated with better life development in an imprecise information environment. In turn, Kolviret al. [121] combined MCDM methods (TOPSIS and SAW, for example) with artificial intelligence tools (HANN and ANFIS) for improving the predictive accuracy of their assessments in Central Iran. In a different context (Russia), Trubnikov et al. [122] also combined an MCDM method (AHP) with an artificial intelligence algorithm (Random Forest algorithm).

Table 12. Articles reviewed concerning “SDG 3: Good Health and Well-being”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Hu and Tzeng (2017) [117]	Fuzzy DEMATEL + fuzzy ANP + fuzzy VIKOR	Integration of MCDM methods. Use of fuzzy logic.	Regional (OECD)
Peiró-Palomino and Picazo-Tadeo (2018) [118]	DEA + Benefit-of-the-Doubt (BoD) principle + MOLP	Combination of MCDM and non-MCDM methods.	Regional (OECD Countries + Brazil, Russia and South Africa)
Liu et al. (2019) [119]	DEMATEL+ ANP + VIKOR	Integration of MCDM methods.	National (China)
Yazdani et al. (2020) [120]	DEMATEL + BWM + EDAS	Integration of MCDM methods.	National (Spain)
Kolvret et al. (2020) [121]	HANN + ANFIS + TOPSIS + SAW	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of artificial intelligence.	Local (Central Iran)
Trubnikov et al. (2020) [122]	AHP + Random Forest (RF) algorithm	Integration of MCDM methods. Use of artificial intelligence.	National (Russia)
Halder et al. (2020) [123]	AHP + GIS	Combination of MCDM and non-MCDM methods.	Local (Rajpur-Sonarpur, India)

Note: The abbreviations signify the following: DEMATEL—Decision Making Trial and Evaluation Laboratory; ANP—Analytic Network Process; VIKOR—Vlekriterijumsko KOMpromisno Rangiranje; DEA—Data Envelopment Analysis; MOLP—Multiple Objective Linear Programming; BWM—Best-Worst Method; EDAS—Evaluation based on Distance from Average Solution; HANN—Hybrid Artificial Neural Network; ANFIS—Adaptive Neuro-Fuzzy Inference System; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; SAW—Simple Additive Weighting; AHP—Analytic Hierarchy Process; GIS—Geographical Information System.

4.4.3. SDG 4: Inclusive and Quality Education

Table 13 presents the reviewed articles’ findings and MCDM’s contributions for SDG 4 achievement [124–128].

Table 13. Articles reviewed concerning “SDG 4: Quality Education”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Kurilovas (2018) [124]	ETAS-M + UTAUT	Combination of MCDM and non-MCDM methods.	Unidentified
Weng et al. (2019) [125]	DEMATEL + ANP + IPA	Integration of MCDM methods. Combination of MCDM and non-MCDM methods.	National (China)
Aldowah et al. (2019) [126]	DEMATEL	Single MCDM.	Unidentified
Zia et al. (2019) [127]	AHP	Single MCDM.	National (Malaysia)
Coco et al. (2020) [128]	DEA + SMAA	Combination of MCDM and non-MCDM methods.	Regional (OECD Countries)

Note: The abbreviations signify the following: ETAS-M—Educational Technology Acceptance & Satisfaction Model; UTAUT—Unified Theory of Acceptance and Use of Technology; DEMATEL—Decision Making Trial and Evaluation Laboratory; ANP—Analytic Network Process; IP—Importance Performance Analysis; AHP—Analytic Hierarchy Process; DEA—Data Envelopment Analysis; SMAA—Stochastic Multicriteria Acceptability Analysis.

By reviewing the articles focusing on quality education issues, most authors combined MCDM methods with non-MCDM methods [124,125,127] for more reliable results concerning performance assessment problems within the educational area. In contrast, two studies [126,127] applied single MCDM methods, namely AHP and DEMATEL.

According to the MCDM taxonomy adopted in this review [34], two utility-based methods (AHP and ANP) were used to help decision-makers involved in educational questions in China and Malaysia [125,127]. A multi-objective method (DEA) combined with SMAA was employed to produce an overall (probability) ranking of schools, aiming to evaluate the inequality within and across OECD countries and then identify educational inequality trends in a given time frame [128].

Finally, Kurilovas [124] evaluated the suitability, acceptance, and use of Augmented Reality (AR) applications in real-life pedagogical situations in educational institutions by combining the Educational Technology Acceptance & Satisfaction Model (ETAS-M) with the Unified Theory of Acceptance and Use of Technology (UTAUT). Both methods are

specific for this category and can help teachers and students select the most suitable AR applications for their needs and improve learning quality and effectiveness.

4.4.4. SDG 7: Affordable and Clean Energy

Table 14 presents the findings of the reviewed articles in this category [129–152].

For “Affordable and Clean Energy” (SDG 7), the MCDM methods are primarily used to plan and manage clean energy projects, being the AHP method the most applied among the MCDM methods (17 amongst 24 studies). Besides, most of the reviewed studies referred to SDG 7 were conducted as part of environmental impact assessments. Authors who used MCDM methods to choose energy policy scenarios considered the promotion of the use of energy from Renewable Energy Sources (RES) [140,141,145,149] or RES compared with energy efficiency policies [135,152]. It is worth mentioning that all of these authors used the AHP method or an MCDM approach that uses multi-attribute techniques since the central idea prioritized policy scenarios.

Seven studies employed single MCDM methods, namely AHP [135,136,139,140], MAUT [137], and PROMETHEE [148,152]. By way of illustration, Mirjat et al. [135] applied the AHP method and sensitivity analysis to build electricity generation scenarios for Pakistan’s sustainable energy planning. Combined with fuzzy logic, the AHP method was also used by Acar et al. [136] to analyze hydrogen production systems’ sustainability to guide researchers, policy-makers, different industries, and energy market customers.

Regarding the integration of MCDM methods, this approach was adopted in 13 studies [131,133,134,138,141,142,144–146,149–152]. For example, Debbarma et al. [131] integrated AHP, PROMETHEE II, and VIKOR to determine the optimal performance-emission trade-off vantage in a hydrogen-biohol dual fuel endeavor. To evaluate and select the most appropriate renewable energy alternatives in Turkey, Büyüközkan et al. [133] developed a fuzzy AHP/COPRAS to help policy-makers better structuring local energy policies concerning global efforts in this country. In turn, Ren and Toniolo [134] integrated three MCDM methods (DEMATEL, EDAS, and ISWM) and used sensitivity analysis to rank hydrogen production pathways under uncertainty.

In relation to hybrid approaches combining MCDM and non-MCDM methods, five studies employed different combinations, as follows: Delphi technique, SWOT analysis, and AHP [125], fuzzy AHP and GRA [132], fuzzy AHP and fuzzy AD [143], DEMATEL and GRA [147], fuzzy AHP, fuzzy WASPAS, and Delphi technique [149].

Aligned with the MCDM taxonomy adopted in this review, eight studies employed compromise methods, namely VIKOR [131,142], COPRAS [133,144], EDAS [134,144], ISWM [134], TOPSIS [138,141,142,145]. Four utility-based methods were applied in most of the studies, as follows: AHP [129–133,135,136,138–145,149,151,152], MAUT [137,146], MA and MAV [150]. Four studies used outranking methods, namely: PROMETHEE II [131,152], PROMETHEE [148,151] and ELECTRE [151].

Finally, it is important to mention that eight studies [130,132,133,136,138,142,143,149] combined fuzzy logic with MCDM methods, and two [132,147] used artificial intelligence approaches. For instance, Ocon et al. [132] used Grey Relational Analysis (GRA) combined with a fuzzy-AHP approach to select hybrid energy systems for off-grid electrification in Marinduque (Philippines).

Table 14. Articles concerning “SDG 7: Affordable and Clean Energy”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Guerrero-Liquet et al. (2016) [129]	Delphi technique + SWOT analysis + AHP	Combination of MCDM and non-MCDM methods.	National (Dominican Republic)
Wang et al. (2016) [130]	Fuzzy AHP	Single MCDM. Use of fuzzy logic.	Local (Jiangsum, China)
Debbarma et al. (2017) [131]	AHP + PROMETHEE II + VIKOR	Integration of MCDM methods.	Unidentified
Ocon et al. (2018) [132]	Fuzzy AHP + GRA	Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of artificial intelligence.	Local (Marinduque, Philippines)
Büyükožkan et al. (2018) [133]	Fuzzy AHP + fuzzy COPRAS	Integration of MCDM methods. Use of fuzzy logic.	National (Turkey)
Ren and Toniolo (2018) [134]	DEMATEL + EDAS + ISWM + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	Unidentified
Mirjat et al. (2018) [135]	AHP + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	National (Pakistan)
Acar et al. (2018) [136]	Fuzzy AHP + sensitivity analysis	Single MCDM. Use of fuzzy logic. Use of sensitivity analysis.	Unidentified
Simsek et al. (2018) [137]	MAUT	Single MCDM method.	Unidentified
Acar et al. (2019) [138]	Fuzzy AHP + fuzzy TOPSIS + sensitivity analysis	Integration of MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	Unidentified
Kumar et al. (2019) [139]	AHP	Single MCDM.	Local (Hilly, Nepal)
Ingole et al. (2019) [140]	AHP	Single MCDM.	National (India)
Aryanpur et al. (2019) [141]	AHP + TOPSIS + Summed Rank Analysis	Integration of MCDM methods.	National (Iran)
Taylan et al. (2020) [142]	Extended fuzzy AHP + fuzzy VIKOR + fuzzy TOPSIS + sensitivity analysis	Integration of MCDM methods.	National (Saudi Arabia)
Feng (2020) [143]	Fuzzy AHP + fuzzy AD + sensitivity analyses	Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	National (China)
Abdel-Basset et al. (2020) [144]	AHP + COPRAS + EDAS	Integration of MCDM methods.	Unidentified
Jadoon et al. (2020) [145]	AHP + TOPSIS + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	National (Pakistan)
Rasheed et al. (2020) [146]	SMART + MAUT + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	Regional (South Asian)
Li et al. (2020) [147]	DEMATEL + GRA	Combination of MCDM and non-MCDM methods. Use of artificial intelligence.	Unidentified
Phillis et al. (2020) [148]	PROMETHEE + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Regional (Europe)
Solangi et al. (2020) [149]	Fuzzy AHP + fuzzy WASPAS + Delphi technique	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	National (Turkey)
Kurttila et al. (2020) [150]	MA + MAV	Integration of MCDM methods.	National (Finland)
Singh et al. (2020) [151]	AHP + PROMETHEE + ELECTRE + sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	National (Nepal)
Neofytou et al. (2020) [152]	PROMETHEE II + AHP	Integration of MCDM methods.	National (14 countries of different continents, profiles, and progress concerning sustainable energy transition.

Note: The abbreviations signify the following: SWOT—Strengths, Weaknesses, Opportunities, and Threats; AHP—Analytic Hierarchy Process; PROMETHEE II—Preference Ranking Organization Method for Enrichment of Evaluations; VIKOR—Vlekkriterijumsko KOMPromisno Rangiranje; GRA—Grey Relational Analysis; fuzzy AD—fuzzy Axiomatic Design; COPRAS—Complex Proportional Assessment; DEMATEL—Decision Making Trial and Evaluation Laboratory; EDAS—Evaluation based on Distance from Average Solution; ISWM—Interval Sum Weighting Method; GIS—Geographical Information System; fuzzy AD—fuzzy Axiomatic Design; SMART—Simple Multi-Attribute Rating Technique; MAUT—Multi-Attribute Utility Theory; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; WASPAS—Weighted Aggregated Sum Product Assessment; MA—Multicriteria Approval; MAV—Multicriteria Approval Voting; ELECTRE—Elimination et Choix Traduisant la Réalité.

4.4.5. SDG 11: Sustainable Cities and Communities

A summary of the MCDM research concerning SDG 11 [153–161] is presented in Table 15.

Table 15. Articles reviewed concerning “SDG 11: Sustainable Cities and Communities”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Said et al. (2017) [153]	COPRAS	Single MCDM.	Local (Sarawak, Malaysia)
Zinatizadeh et al. (2017) [154]	ELECTRE + TOPSIS + SAW + IFPSI	Integration of MCDM methods.	Local (Kermanshah, Iran)
Lehner et al. (2018) [155]	AHP + GIS + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Local (generic)
Gökçekeş et al. (2019) [156]	Fuzzy PROMETHEE	Single MCDM. Use of fuzzy logic.	Unidentified
Ahmed et al. (2019) [157]	AHP + TOPSIS + OSM + sensitivity analysis	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Unidentified
Phonphoton and Pharino (2019) [158]	AHP	Single MCDM.	Local (Bangkok, Thailand)
Nesticò et al. (2020) [159]	ANP + ZOGP + fuzzy Delphi technique	Integration of MCDM methods. Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	Local (Campania, Italy)
Mansour et al. (2020) [160]	AHP + PLS-SEM + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Unidentified
Chen and Zhang (2020) [161]	IOWA	Single MCDM.	Local (Liaoning, China)

Note: The abbreviations signify the following: COPRAS—Complex Proportional Assessment; ELECTRE—Elimination et Choix Traduisant la Réalité; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; SAW—Simple Additive Weighting; IFPSI—Improved Full Permutation Polygon Synthetic Indicator; AHP—Analytic Hierarchy Process; GIS—Geographical Information System; fuzzy PROMETHEE—fuzzy Preference Ranking Organization Method for Enrichment of Evaluations; OSM—Optimal Scoring Method; ANP—Analytic Network Process; ZOGP—Zero-One Goal Programming; PLS-SEM—Partial Least Squares—Structural Equation Modeling; IOWA—Induced Ordered Weighted Averaging.

Concerning sustainable urban construction problems, two articles integrated the AHP method with other methods and used sensitivity analysis [157,160]. Ahmed et al. [157] integrated AHP, TOPSIS, and OSM methods to prioritize sustainable concrete supplementary materials. In turn, Mansour et al. [160] also used a hybrid MCDM approach to prioritize investment in the construction industry to achieve SDG 11 targets in Saudi Arabia.

Four articles are centered on investigating other problems in urban areas. Said et al. [153] ranked alternatives for dealing with housing affordability. Zinatizadeh et al. [154] focused on assessing and predict urban sustainability in different areas. Nesticò et al. [159] used the ANP method integrated with ZOGP and fuzzy Delphi technique to define urban land use policy in Campania (Italy). Chen and Zhang [161] used the IOWA method to evaluate the sustainability performance of 14 cities in China.

Four studies used utility-based methods, namely the AHP method, single or combined with other MCDM methods for different purposes [155,157,159,160]. By way of illustration, Lehner et al. [155] used the AHP method combined with GIS and sensitivity analysis to identify the most relevant urban sustainability indicators for monitoring cities’ services and quality of life (QoL) employing remote sensing techniques. Phonphoton and Pharino [159] employed only the AHP method to choose appropriate alternatives to mitigate the impact of municipal solid waste management services during floods in cities.

As depicted in Table 15, four studies employed compromise methods, as follows (i) COPRAS [153], (ii) TOPSIS [154,157], (iii) SAW and IFPSI [154], and (iv) IOWA [161]. The remaining studies applied outranking methods (PROMETHEE and ELECTRE [154,161] and the multi-objective ZOGP [159].

4.5. Biosphere: SDG 6, SDG 13, SDG 14, and SDG 15

For the achievement of SDGs belonging to this category, several applications of MCDM methods reported in 36 studies are presented and discussed here, as follows: SDG 6—“Clean

Water and Sanitation” [162–168], SDG 13–“Climate Action” [169–182], SDG 14–“Life below Water” [183–188], and SDG 15–“Life on Land” [189–197].

4.5.1. SDG 6: Clean Water and Sanitation

Table 16 summarizes the articles reviewed in this category and the contributions of MCDM methods for the achievement of SDG 6 [158–164].

Table 16. Articles reviewed concerning “SDG 6: Clean Water and Sanitation”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Kumar et al. (2016) [162]	Fuzzy ELECTRE-III-H	Single MCDM. Use of fuzzy logic.	Local (Tarragona, Spain)
Woltersdorf et al. (2018) [163]	AHP	Single MCDM.	Local (Outapi, Namibia)
Salisbury et al. (2018) [164]	MAUT	Single MCDM.	Local (eThekweni, South Africa)
Ezbakhe et al. (2018) [165]	MAUT and ELECTRE III	Two single MCDM methods are used separately.	National (Kenya)
Nie et al. (2018) [166]	BWM + DEMATEL + fuzzy TOPSIS + sensitivity analysis	Integration of MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	Local (industrial regions in China)
Vidal et al. (2019) [167]	ELECTRE III + scenario analysis + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Unidentified
Oliveira Campos et al. (2020) [168]	TOPSIS	Single MCDM.	Local (Itaperuna, Brazil)

Note: The abbreviations signify the following: ELECTRE III-H—Elimination et Choix Traduisant la Réalité III—Hiérarchie; AHP—Analytic Hierarchy Process; MAUT—Multi-Attribute Utility Theory; BWM—Best-Worst Method; DEMATEL—Decision Making Trial and Evaluation Laboratory; TOPSIS—Technique for Order Preference by Similarity to Ideal Solution.

Most of the articles considered water security as a strategy for achieving SDG 6 targets and prioritizing options by using several MCDM approaches [162,163,165,166,168]. Based on information synthesized in Table 16, it is evident that most studies used single MCDM methods, particularly ELECTRE III-H [162], AHP [163], MAUT [164], and TOPSIS [168]. For example, Kumar et al. [162] developed scenarios for future imbalances in water supply and demand for one water-stressed Mediterranean area of Northern Spain (Tarragona) and tested the applicability of fuzzy ELECTRE-III-H method for evaluating sectoral water allocation policies.

The integration of MCDM methods could be observed in two studies [165,166]. Ezbakhe et al. [165] integrated MAUT with ELECTRE III for considering data uncertainty in water sanitation and hygiene planning in Kenya. To evaluate water security sustainability in industrial regions in China, Nie et al. [166] developed a multistage decision support framework, combining BWM, DEMATEL, fuzzy TOPSIS, and sensitivity analysis. Regarding hybrid approaches combining MCDM and non-MCDM methods, only one study [167] employed this approach. Vidal et al. [167] used ELECTRE III combined with scenario analysis and sensitivity analysis to assess the sustainability of on-site sanitation systems.

Following the MCDM taxonomy adopted in this review, eight studies three studies employed utility-based methods, namely AHP [163] and MAUT [164,165]. Concerning outranking methods, they were used in three studies: ELECTRE-III-H [158], ELECTRE III [165,167]. Since various degrees of ambiguity in deciding are observed, it is recommended to combine MCDM methods with fuzzy logic, which was observed in [162,166].

4.5.2. SDG 13: Climate Action

Table 17 contains a summary of the reviewed articles and the main contributions of MCDM methods related to the achievement of SDG 13 [169–182].

Table 17. Articles reviewed concerning “SDG 13: Climate Action”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Song et al. (2016) [169]	TOPSIS + RUS + Delphi technique + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	National (South Korea)
Panhalkar and Jarag (2017) [170]	AHP + GIS	Combination of MCDM and non-MCDM methods.	Local (Maharashtra, India)
Maanan et al. (2017) [171]	GIS + AHP	Combination of MCDM and non-MCDM methods.	National (Morocco)
Brudermann and Sangkakool (2017) [172]	AHP + SWOT analysis	Combination of MCDM and non-MCDM methods.	Regional (Europe)
Zahmatkesh and Karamouz (2017) [173]	AHP + Monte Carlo (MC) simulation	Combination of MCDM and non-MCDM methods.	Local (New York, USA)
Seenirajan et al. (2018) [174]	AHP+ GIS	Combination of MCDM and non-MCDM methods.	Local (Ambasamudram, India)
Mallick et al. (2018) [175]	Fuzzy AHP + WLC + GIS + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	Local (Asee, Saudi Arabia)
Mistage and Bilotta (2018) [176]	AHP + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Unidentified
Alhumaid et al. (2018) [177]	AHP + PROMETHEE II + Sensitivity analysis	Integration of MCDM methods. Use of sensitivity analysis.	Local (Buraydah, Saudi Arabia)
Yazdani et al. (2019) [178]	SWARA + FMEA + EDAS + Sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	Local (Alboraya, Spain)
Florindo et al. (2020) [179]	Fuzzy TOPSIS + SWOT analysis	Combination of MCDM and non-MCDM methods. Use of fuzzy logic.	National (Brazil)
Stričević et al. (2020) [180]	AHP + TOPSIS	Integration of MCDM methods.	National (Serbia)
Dutta et al. (2020) [181]	AHP	Single MCDM.	Local (West Bengal, India)
Gandini et al. (2020) [182]	AHP + VF + GIS	Integration of MCDM methods. Combination of MCDM and non-MCDM methods.	Local (Northern Spain)

Note: The abbreviations signify the following: TOPSIS—Technique for Order Preference by Similarity to Ideal Solution; RUS—Robustness Uncertainty-Sensitivity; AHP—Analytic Hierarchy Process; GIS—Geographical Information System; WLC—Weighted Linear Combination; PROMETHEE II—Preference Ranking Organization Method for Enrichment of Evaluations II; SWARA—Step-wise Weight Assessment Ratio Analysis; FMEA—Failure Mode and Effects Analysis; EDAS—Evaluation based on Distance from Average Solution; SWOT—Strengths, Weaknesses, Opportunities, and Threats; VF—Value Function.

Most of the decision problems concerning SDG 13 were linked to map and describe areas with flood risks associated with climate change impacts [170,171,173,174,177,182]. From the results shown in Table 17, one can observe that the AHP method (integrated or not with other methods) was the most used in these articles. By way of illustration, Panhalkar and Jarag [170] assessed flood risk assessment of Panchganga River in Maharashtra (India) using the AHP method combined with GIS. In turn, Maanan et al. [171] also used this methodological approach to assess coastal vulnerability, resulting from human activity, population density, erosion, and climate change-induced sea-level rise in Morocco. Seenirajan et al. [174] applied an AHP/GIS approach to rank and displayed the potentially risky areas in the watersheds area of Ambasamuthiram Town (India).

Three studies used the TOPSIS method, combined with other methods [169,179,180]. For example, Song et al. [170] employed TOPSIS and RUS, combined with the Delphi technique and sensitivity analysis, to evaluate and rank the spatial flood vulnerability to climate change in South Korea. Florindo et al. [179] applied TOPSIS and SWOT analysis to rank possible Carbon Footprint reduction actions in the Brazilian beef production chain.

Finally, to rank different agricultural projects planned to mitigate the flood risks and their impacts on the sustainability of an agriculture supply chain in Alboraya (Spain), Yazdani et al. [178] combined MCDM with non-MCDM methods, namely SWARA, EDAS, FMEA, and sensitivity analysis.

4.5.3. SDG 14: Life below Water

Regarding MCDM applications to achieve this SDG, a summary of the reviewed papers related to SDG 14 [183–188] is presented in Table 18.

Table 18. Articles reviewed concerning “SDG 14: Life below Water”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Wijenayake et al. (2016) [183]	AHP + GIS	Combination of MCDM and non-MCDM methods.	National (Sri Lanka)
Nayak et al. (2018) [184]	AHP + GIS	Combination of MCDM and non-MCDM methods.	Local (Central Himalayas, India)
Henríquez-Antipa and Cárcamo (2019) [185]	SWOT analysis + AHP	Combination of MCDM and non-MCDM methods.	National (Chile)
Chen et al. (2019) [186]	Delphi technique + AHP	Combination of MCDM and non-MCDM methods.	National (Taiwan)
Luna et al. (2019) [187]	AHP + GA	Integration of MCDM Methods. Use of artificial intelligence.	National (Spain)
Dorfan et al. (2020) [188]	Fuzzy AHP + GPM	Integration of MCDM methods. Use of fuzzy logic.	Local (Dayyer Port, Iran)

Note: The abbreviations signify the following: AHP—Analytic Hierarchy Process; GIS—Geographical Information System; SWOT—Strengths, Weaknesses, Opportunities, and Threats; GA—Genetic Algorithm; GPM—Goal Programming Model.

Most of the reviewed articles concerning SDG 14 focused on culture-based fishery development in several contexts [183,184,186,188]. For instance, Wijenayake et al. [183] combined a utility-based method (AHP) with GIS to select non-perennial reservoirs for culture-based fishery development in Sri Lanka, whereas Nayak et al. [184] employed the same methods to assess the soil, water, and infrastructure facilities for enhancing fishery resource development in Central Himalayas (India). Chen et al. [186] used the Delphi technique and the AHP method to establish an evaluation structure for high-use fishery harbors in Taiwan, while Dorfan et al. [188] used the Goal Programming Model integrated into the fuzzy AHP approach. Besides, fuzzy logic combined with MCDM methods was employed in [188], aiming to support decision-making processes concerning shrimp fishery in Iran.

To interpret stakeholders’ multidimensional perceptions on policy implementation gaps regarding the current status of Chilean small-scale seaweed aquaculture, Henríquez-Antipa and Cárcamo [185] applied the AHP method combined with SWOT analysis. In turn, Luna et al. [187] employed AHP integrated with Genetic Algorithm (GA) to determine the best feeding strategies in aquaculture farms in Spain.

As shown in Table 18, the combination of MCDM methods with non-MCDM methods (Delphi technique, SWOT analysis, Genetic Algorithm, and Geographical Information Systems) was adopted by most of the reviewed articles [183–186].

4.5.4. SDG 15: Life on Land

Table 19 presents the reviewed articles’ findings that addressed issues associated with SDG 15 [189–197].

Five studies combined MCDM methods (utility-based, compromise, or outranking) with Geographical Information Systems [189,191,193,195,196]. By way of illustration, Ahmadi Sani et al. [189] adopted an AHP-GIS approach to rank alternative land uses in Zagros (Iran) to improve the management of vulnerable ecosystems and prevent further degradation and increasing sustainability of land use in that region.

Table 19. Articles reviewed concerning “SDG 15: Life on Land”.

Author(s)	Method(s)	Methodological Approach	Context of Application
Ahmadi Sani et al. (2016) [189]	GIS + AHP	Combination of MCDM and non-MCDM methods.	Local (Zagros, Iran)
Diaz-Balteiro et al. (2016) [190]	GP	Single MCDM.	Local (Northwestern Spain)
Çalışkan (2017) [191]	GIS + S-TOPSIS	Combination of MCDM and non-MCDM methods.	Local (Trabzon, Turkey)
Tecle and Verdin (2018) [192]	AHP + sensitivity analysis	Single MCDM. Use of sensitivity analysis.	Local (Durango, Mexico)
Gigović et al. (2018) [193]	GIS + AHP	Combination of MCDM and non-MCDM methods.	Local (Nevesinje, Bosnia)
Korkmaz and Gurer (2018) [194]	TOPSIS	Single MCDM.	Local (Bucak and Sutculer, Turkey)
Jeong (2018) [195]	PROMETHEE + PGIS + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of sensitivity analysis.	National (Spain)
Kacem et al. (2019) [196]	GIS + fuzzy AHP + sensitivity analysis	Combination of MCDM and non-MCDM methods. Use of fuzzy logic. Use of sensitivity analysis.	National (Morocco)
Wu et al. (2020) [197]	AHP	Single MCDM.	Local (Guandong and Tibet, China)

Note: The abbreviations signify the following: GIS—Geographical Information System; AHP—Analytic Hierarchy Process; S-TOPSIS—Spatial Integrated Technique for Order Preference by Similarity to Ideal Solution; PROMETHEE—Preference Ranking Organization Method for Enrichment of Evaluations; PGIS—Participatory Geographical Information System.

The remaining studies [190,192,194,197] used single MCDM methods (GP, AHP, and TOPSIS) for different purposes. Diaz-Balteiro et al. [190] used a multi-objective method (Goal Programming) to rank industrial forest plantations in Northwestern Spain, from the perspective of sustainability, while Tecle and Verdin [192] employed a utility-based MCDM approach and sensitivity analysis to determine the most efficient way of allocating a budget for multi-purpose forest management in Durango (Mexico).

In summary, five studies used a utility-based method (AHP), combined or not with non-MCDM methods [189,192,193,196,197], while two applied compromise methods (S-TOPSIS and TOPSIS) [191,194] and the remaining employed a multi-objective method (Goal Programming) and an outranking method (PROMETHEE) [190,195] respectively.

5. Conclusions

In this paper, an attempt was made to conduct a systematic literature review on the MCDM applications in various contexts concerning SDGs achievements. In this regard, 143 published scientific articles from 2016 to 2020 were retrieved from the Scopus database, selected, and reviewed. From the 17 SDGs defined in the 2030 Agenda framework, almost all were considered in this review. Only four SDGs had no work identified in the review process (i.e., SDG1, SDG 5, SDG 16, and SDG 17 (see Appendix A)).

The objectives of this study were achieved, and the findings summarized in Sections 3 and 4 make significant contributions to the state-of-the-art on MCDM approaches focusing on the 2030 Agenda framework. In fact, the results shed light on the main MCDM applications to support decisions concerning the 2030 Agenda as a whole, multiple SDGs issues, and single SDGs classified into three categories: economy, society, and biosphere.

The main conclusions associated with the research questions defined in the introductory section can be stated as follows.

The results shown in Figure 4 confirm the methodological trends observed in the MCDM literature, i.e., the integration of MCDM methods, the combination of MCDM with non-MCDM methods. Concerning the integration of MCDM methods, the most common is the hybrid AHP-TOPSIS method. The integration of ANP and DEMATEL methods can also be highlighted since DEMATEL is used in more than 70% of the studies in which ANP is employed. In turn, focusing on the 52 articles that combine MCDM and non-MCDM methods, some studies include MCDM methods with SWOT analysis, Delphi technique, and Geographical Information Systems (GIS). The most popular MCDM and non-MCDM

combinations are those related to the AHP method with GIS. This combination appears in 83% of articles when GIS is used.

In terms of the higher incidence of MCDM applications within the 2030 Agenda framework, the category with more MCDM applications is “Society”, encompassing 56 studies, being 24 studies focused on decision-problems concerning SDG 7 (“Affordable and Clean Energy”). In the second and the third positions, “Biosphere” comprises 36 studies, and “Economy” 33 studies. Finally, 18 studies are associated with the first two categories—“The 2030 Agenda” and “Multiple SDGs”.

From the perspective of building a research agenda in this field, out of 143 reviewed articles, more than 50% suggested future directions to expand the MCDM knowledge base applied to decision-making processes concerning issues within the 2030 Agenda framework. Accordingly, further research suggestions can be summarized as follows:

- Broader utilization of MCDM methods (single or hybrid) to expand the MCDM knowledge-base to be widely applied within the 2030 Agenda framework for SDGs achievement in the most diverse contexts (regional, national, or local contexts);
- Replication of reviewed conceptual MCDM models amongst the various categories above mentioned, and also in studies focusing MCDM applications in SDGs not covered in the literature (i.e., SDG 1, SDG5, SDG 15, and SDG16);
- Combination of MCDM and non-MCDM methods to explore the potential of artificial intelligence and advanced management and statistical tools to enhance the analytical accuracy of studies;
- Utilization of different versions of fuzzy set theory (e.g., hesitant fuzzy sets and intuitionistic fuzzy) combined with MCDM methods;
- Prospective analysis and foresight tools (e.g., prospective structural analysis) to complement MCDM approaches, considering the time-frame of the 2030 Agenda;
- MCDM processes applied to issues within the 2030 Agenda framework should encourage the engagement of stakeholders representing multiple sectors and levels.

The findings presented in this paper can help policy-makers, researchers, and practitioners by providing directions about MCDM applications in various contexts concerning SDGs achievements within the 2030 Agenda framework. The previously mentioned findings and research agenda here presented can support new research projects and teaching activities related to MCDM methods from the perspective of their potential use in those contexts.

As discussed in this paper, policy-makers can better explore MCDM applications to prioritize projects and programs for SDGs achievement and define public policies addressed to the 2030 Agenda implementation in different contexts. Besides, practitioners within public and private organizations from diverse sectors can replicate and improve existing MCDM models to enhance their strategic decision-making processes regarding resource allocation to corporate strategies associated with one or more SDGs.

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Appendix A. Search History in the Scopus Database

Table 1. Search strategy in Scopus database.

Ref.	Keyword Search	Documents
#1	(TITLE-ABS-KEY ("criteria decision mak") OR TITLE-ABS-KEY ("criteria decision-mak") OR TITLE-ABS-KEY (MCDM) OR TITLE-ABS-KEY ("criteria decision analy") OR TITLE-ABS-KEY ("criteria decision-analy") OR TITLE-ABS-KEY (MCDA))	24,502
#2	(TITLE-ABS-KEY (SDG) OR TITLE-ABS-KEY ("sustainable development goal") OR TITLE-ABS-KEY ("2030 Agenda") OR TITLE-ABS-KEY ("sustainable development"))	228,771
#3	#1 AND #2	1756
#4	#3 AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016))	1169
#5	#4 AND (LIMIT-TO (DOCTYPE, "article"))	867
#6	#5 AND (LIMIT-TO (LANGUAGE, "English"))	863
#7	#6 AND TITLE-ABS-KEY ("poverty eradication") OR TITLE-ABS-KEY ("no poverty") TITLE-ABS-KEY (SDG 1)	0
#8	#6 AND (TITLE-ABS-KEY ("zero hunger") OR TITLE-ABS-KEY ("food security") OR TITLE-ABS-KEY ("improved nutrition") OR TITLE-ABS-KEY ("agriculture") OR TITLE-ABS-KEY (SDG 2))	18
#9	#6 AND (TITLE-ABS-KEY ("healthy lives") OR TITLE-ABS-KEY ("health system") OR TITLE-ABS-KEY ("well-being") OR TITLE-ABS-KEY (SDG 3))	6
#10	#6 AND (TITLE-ABS-KEY ("equitable education") OR TITLE-ABS-KEY ("education") OR TITLE-ABS-KEY ("life-long learning") OR TITLE-ABS-KEY (SDG 4))	4
#11	#6 AND (TITLE-ABS-KEY (gender AND equality) OR TITLE-ABS-KEY (SDG 5))	0
#12	#6 AND (TITLE-ABS-KEY ("clean water") OR TITLE-ABS-KEY ("sanitation") OR TITLE-ABS-KEY ("water supply") OR TITLE-ABS-KEY ("water conservation") OR TITLE-ABS-KEY (SDG 6))	38
#13	#6 AND (TITLE-ABS-KEY ("energy efficiency") OR TITLE-ABS-KEY ("energy policy") OR TITLE-ABS-KEY ("alternative energy") OR TITLE-ABS-KEY ("renewable energy") OR TITLE-ABS-KEY ("energy utilization") OR TITLE-ABS-KEY ("renewable energies") OR TITLE-ABS-KEY ("renewable energy resources") OR TITLE-ABS-KEY ("electricity generation") OR TITLE-ABS-KEY ("energy conservation") OR TITLE-ABS-KEY ("energy planning") OR TITLE-ABS-KEY ("wind power") OR TITLE-ABS-KEY ("electric power generation") OR TITLE-ABS-KEY ("solar energy") OR TITLE-ABS-KEY (SDG 7))	162
#14	#6 AND (TITLE-ABS-KEY ("decent work") OR TITLE-ABS-KEY ("sustainable economic growth") OR TITLE-ABS-KEY ("economic and social effects") OR TITLE-ABS-KEY ("economic development") OR TITLE-ABS-KEY (SDG 8))	86
#15	#6 AND (TITLE-ABS-KEY ("resilient infrastructure") OR TITLE-ABS-KEY ("sustainable industrialization") OR TITLE-ABS-KEY (innovation) OR TITLE-ABS-KEY (manufacturing) OR TITLE-ABS-KEY ("environmental technology") OR TITLE-ABS-KEY ("sustainable supply chain") OR TITLE-ABS-KEY ("sustainability performance") OR TITLE-ABS-KEY ("supplier selection") OR TITLE-ABS-KEY (SDG 9))	127
#16	#6 AND (TITLE-ABS-KEY (reduced AND inequalities) OR TITLE-ABS-KEY (SDG 10))	2
#17	#6 AND (TITLE-ABS-KEY ("sustainable cities") OR TITLE-ABS-KEY ("Urban Planning") OR TITLE-ABS-KEY ("urban area") OR TITLE-ABS-KEY ("municipal solid waste") OR TITLE-ABS-KEY (SDG 11))	45
#18	#6 AND (TITLE-ABS-KEY ("sustainable consumption") OR TITLE-ABS-KEY ("sustainable production") OR TITLE-ABS-KEY ("life cycle analysis") OR TITLE-ABS-KEY ("life cycle assessment") OR TITLE-ABS-KEY ("waste management") OR TITLE-ABS-KEY (SDG 12))	134
#19	#6 AND (TITLE-ABS-KEY ("climate change") OR TITLE-ABS-KEY ("greenhouse gases") OR TITLE-ABS-KEY ("emission control") OR TITLE-ABS-KEY ("carbon footprint") OR TITLE-ABS-KEY ("carbon dioxide") OR TITLE-ABS-KEY ("global warming") OR TITLE-ABS-KEY (SDG 13))	113
#20	#6 AND (TITLE-ABS-KEY (sustainably AND use AND of AND oceans) OR TITLE-ABS-KEY (sustainably AND use AND of AND seas) OR TITLE-ABS-KEY (sustainable AND use AND of AND marine AND resources) OR TITLE-ABS-KEY (SDG 14))	7
#21	#6 AND (TITLE-ABS-KEY ("life on land") OR TITLE-ABS-KEY ("sustainable use of terrestrial ecosystems") OR TITLE-ABS-KEY ("sustainable management of forest") OR TITLE-ABS-KEY (SDG 15))	65
#22	#6 AND (TITLE-ABS-KEY (peace AND justice AND strong AND institutions) OR TITLE-ABS-KEY (SDG 16))	0

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