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Systematic literature reviews in socio-environmental studies: proposal for the integrative review method

Revisão bibliográfica sistemática em estudos socioambientais: uma proposta do método da revisão integrativa

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Manuscript received on August 26, 2022, final version accepted on June 23, 2023, published on April 12, 2024.

ABSTRACT: Bibliographic systematic reviews emerged in the health area and were later adopted by other scientific fields, based on adaptations to better attend to their study objects. As the socio-environmental field is relatively new, it is hard to find a guide to orient bibliographic systematic reviews about emergent problems in the knowledge area. Therefore, aiming to include qualitative studies, more common to the social and human sciences, as well as quantitative studies, more common to the natural science, this article proposes an integrative review protocol adapted to the specifications of socio-environmental studies. Hence, the literature was verified regarding systematic bibliographic reviews and a documentary survey was carried out, which included forms, templates and support systems to search specific elements, tools and procedures that can be used in the socio-environmental area. The proposal of a specific method has the potential to contribute more rigor to the systematic reviews that take place in the socio-environmental field and to collaborate to the disclosing of its research studies, in addition to the possibility of being used as a tool for interdisciplinarity practice among researchers of the diverse scientific fields in the area.

Keywords: methodology; socio-environmentalism; interdisciplinarity; systematic literature review.

RESUMO: A revisão bibliográfica sistemática surgiu na área da saúde e, posteriormente, passou a ser adotada por outros campos científicos, a partir de adaptações, para melhor atender seus objetos de estudo. Sendo a área socioambiental relativamente nova, é difícil encontrar um guia que oriente a realização de revisões bibliográficas sistemáticas sobre os problemas emergentes desse campo. Dessa forma, a fim de abranger tanto estudos qualitativos, comuns à área das sociais e humanas, quanto quantitativos, mais comuns às

ciências naturais, este artigo propõe um protocolo adaptado da revisão integrativa às especificidades dos estudos socioambientais. Para tanto, realizou-se uma verificação de literatura acerca da revisão bibliográfica sistemática e um levantamento documental que inclui formulários, guias, *templates* e sistemas de apoio, buscando elementos, ferramentas e procedimentos que podem ser utilizados na área socioambiental. A proposta de um método específico tem o potencial de trazer mais rigor para as revisões sistemáticas realizadas pelo campo socioambiental, de colaborar para a divulgação de suas pesquisas, além de poder ser empregado como uma ferramenta para a prática interdisciplinar entre os pesquisadores provenientes das diferentes classes científicas da área.

Palavras-chave: metodologia; socioambientalismo; interdisciplinaridade; revisão sistemática de literatura.

1. Introduction

A literature review is a crucial stage in the construction of scientific knowledge. Through its development, it is possible to comprehend the current state of knowledge on a specific topic, as well as identify potential gaps that offer perspectives for future research (Botelho *et al.*, 2011). Beyond being a collection of information or a summary of a particular research topic, literature review necessitates the accomplishment of synthesis, enabling a deeper understanding of the studied issue (Ingram *et al.*, 2006).

There are various ways to conduct a literature review, ranging from traditional bibliographic review methods, such as narrative review, to more elaborate methods like systematic literature review. These methods require the systematic and protocol-driven conduct of the review by a team of researchers to reduce potential bias, ensure replicability, and provide an updated framework for the researched problem (Rother, 2007; Botelho *et al.*, 2011).

Systematic literature reviews emerged in the health field in the 1970s and later became employed by other disciplines, particularly the exact and natural sciences. More recently, they have been adopted by the social and environmental sciences

(Whittemore & Knafl, 2005; Botelho *et al.*, 2011; CEE, 2018). However, inherent differences in scientific fields require adaptations in applying this review method to respect the peculiarities of their study objects. It is in this direction that the Collaboration for Environmental Evidence (CEE, 2018) proposes a guide for conducting two types of systematic literature reviews (systematic review and systematic mapping) to be applied in studies related to environmental sciences. However, when examining the examples of studies in the CEE guide (2018) and articles published in the Journal of Environmental Evidence - a journal that conditions the submission of review articles to the use of the CEE guide in manuscript preparation - a greater focus is observed on studies in the natural sciences and a lesser emphasis on those related to the socio-environmental area.

The socio-environmental field arises from a profound reconsideration of the human condition in its relationships with nature, drawing attention to a complex and hybrid reality. (Alvarenga *et al.*, 2010; Raynaut, 2018). It is a reality in which different dimensions - cultural, social, political, economic, technical, and biophysical - are interwoven, demanding solutions that cannot be confined to the responses provided by a single scientific discipline.

Hence, it is inherently interdisciplinary (Raynaut, 2018).

Given the nature of the field, where social and environmental dimensions are deeply interconnected, a significant portion of its scientific works does not rely on quantitative or statistical methods. This, initially, might suggest the inadequacy of applying systematic review to evidence review studies conducted in the field, considering the conceptualization of Whitemore & Knafl (2005); Botelho *et al.* (2011) and the CEE (2018).

Among the literature reviewed here, along with the analysis of articles in the field applying various systematic literature review methods (e.g., Brites & Morsello, 2016; Maldonado, 2016; Schneider *et al.*, 2019; Fagundes *et al.*, 2022), the absence of a methodological reference that considers the peculiarities of socio-environmental issues is apparent. Developing such a reference has the potential to guide students and researchers in the field to systematically review an increasingly vast amount of literature - especially in the digital realm - without losing sight of the specificity of their study object and maintaining scientific rigor.

Considering this, this article proposes a methodology for systematically reviewing socio-environmental literature. We have developed a proposal that qualitatively describes the procedure for conducting one of the types of systematic literature review, the integrative review. This type is considered by the authors as the most suitable for studies addressing socio-environmental issues. For this purpose, the literature on systematic literature review with a focus on the socio-environmental area was reviewed, and a survey of documents was conducted, including forms, guides, templates, and support systems that we recommend using in the different stages of the

proposed method. The content of the review and the survey was analyzed and systematized through the selection and/or adaptation of information and procedures to meet the specific needs of the socio-environmental field.

Following this introduction, the next section presents the types of systematic literature review, associating them with the socio-environmental field. Towards the end of the section, the integrative review is proposed as the most suitable type for use in this area. In the subsequent section, a protocol for conducting integrative reviews in socio-environmental research is proposed. Finally, the study concludes with final considerations and a list of references used in the research.

2. Systematic literature review on socio-environmental studies

A literature review seeks bibliographic sources from other authors to theoretically underpin a specific topic, and it can be divided into two categories: narrative review and systematic reviews (Figure 1), as emphasized by Botelho *et al.* (2011).

A **narrative review** essentially involves the analysis of literature and interpretation based on the researcher's personal critical evaluation (Bernardo *et al.*, 2004). It enables the qualitative acquisition and updating of knowledge on a specific topic in a short period. However, this type of review does not provide the methodology for reference search, the sources of information used, or the criteria employed in the assessment and selection of works (Rother, 2007).

A **systematic literature review** is a more elaborate type of review that involves a succession

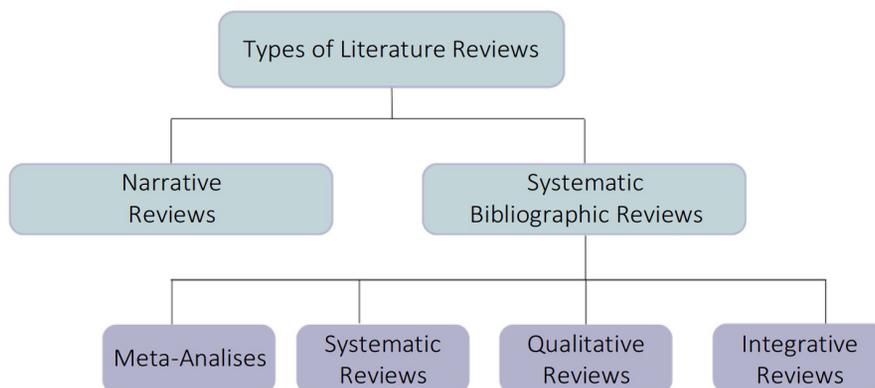


FIGURE 1 – Types of literature review.

SOURCE: Adapted from Botelho et al. (2011).

of pre-defined stages. It is developed based on a clear and specific question, featuring a rigorous and reproducible systematic methodology for collecting and analyzing data (Whittemore & Knafl, 2005). According to Rother (2007) and Botelho *et al.* (2011), it can be subdivided into systematic review, meta-analysis, integrative review, and qualitative review.

These four subtypes are characterized by a planned and comprehensive review of primary studies (Whittemore & Knafl, 2005). The authors explain that systematic review and integrative review differ from each other due to certain factors.

A **systematic review** includes in its sample only quantitative research with similar methodologies that have a rigorous approach to studies with similar hypotheses (Whittemore & Knafl, 2005; Botelho *et al.*, 2011). They often include statistical methods such as meta-analysis¹ or another quasi-statistical approach (Whittemore & Knafl, 2005).

On the other hand, an **integrative review** includes in its sample both quantitative and qualitative research, experimental and non-experimental, theoretical and empirical, bringing a variety of perspectives on a specific phenomenon (research question) (Whittemore & Knafl, 2005). Thus, it provides the systematization of knowledge from studies with different methodologies for use in various purposes, such as defining concepts, reviewing theories, identifying knowledge gaps, analyzing the state of the art, or examining methodological issues in a particular topic (Whittemore & Knafl, 2005; Botelho *et al.*, 2011).

Despite the differences between systematic and integrative reviews, the analyzed literature presents the latter as a derivation of the former (Whittemore & Knafl, 2005; Botelho *et al.*, 2011; CEE, 2018). In the case of integrative review, its emergence took place in the healthcare field in the 1970s, specifically in England with the epidemio-

¹ According to Whittemore & Knafl (2005), meta-analysis refers to the use of abstracted studies coded and included in a quantitative database where statistical methods are applied to advance knowledge objectives and validate data.

logist Archie Cochrane. He proposed systematizing data from primary evidence-based studies to generalize information about a particular phenomenon². Over the years, this type of review has become increasingly utilized and validated in the healthcare field due to the adoption of more systematic and rigorous methods to affirm the effectiveness of an intervention through the gathering and analysis of experimental studies (Whittemore & Knafl, 2005).

Simultaneously, there is an increasing concern in other scientific areas (which have qualitatively different study objects from those in the healthcare field) regarding the rigorous, objective, transparent, and reliable production of knowledge to avoid the risk of error and bias (Whittemore & Knafl, 2005; Botelho *et al.*, 2011; CEE, 2018). In this context, other knowledge areas began to adapt the methodologies developed and established for over two decades in health sciences. Initially, this occurred in the fields of education and social sciences³, and later, in environmental sciences, to provide scientific information for managerial or policy decision-making (CEE, 2018).

In Applied Social Sciences, for instance, Botelho *et al.* (2011) advocate for the use of integrative review in organizational studies due to the need for methods that enable the analysis of contradictions surrounding the studied phenomenon and gathering evidence useful for administrative practices.

Whittemore & Knafl (2005) propose this review for the understanding of complex health concepts, theories, and issues, as it includes a variety of study types in conjunction with a multitude of purposes. And, more recently, around 2010, one can observe the involvement of environmental scientists, through the CEE⁴, in the development of a systematic evidence review protocol adapted for the study of environmental issues, aiming to provide information for decision-making in various sectors of society (CEE, 2018).

Immersed in this trend, there is an increase in the use of integrative review by researchers in social and environmental fields, where procedures do not follow the same pattern and are named by different terms, such as bibliometric research (Schneider *et al.*, 2019), systematic mapping (Maldonado, 2016; CEE, 2018), or systematic review/survey (Brites & Morsello, 2016). In the presented research, we used the term integrative review based on the suggestion of Botelho *et al.* (2011), who rely on the proposal of Whittemore & Knafl (2005). We consider that it encompasses the concept of systematic mapping defined by the EEJ⁵, which is an overview of the distribution and abundance of scientific evidence regarding the multifaceted elements of a broad question of political or managerial relevance (CEE, 2021).

² According to the authors, this review adopts the principle of evidence-based medicine, also known in the field as practice based on indicators, wherein primary information from clinical studies on the same problem is gathered to find scientific evidence supporting interventions and providing information for decision-making in the healthcare field.

³ Many methods for combining qualitative research emerged in the 1990s, such as meta-synthesis, meta-study, grounded theory, meta-ethnography, with the aim of systematizing qualitative results from primary studies into a new theory or a comprehensive framework on the studied phenomenon. They differ in their approach to analysis and levels of interpretation (Patton, 2002; Whittemore & Knafl, 2005).

⁴ CEE is a globally collaborative network aimed at promoting evidence syntheses on the environment (CEE, 2018; EEJ, 2021).

⁵ The EEJ is a journal that facilitates the publication of evidence syntheses around environmental issues in the form of Systematic Reviews and Maps based on the CEE guide. Its scope covers both natural and social sciences.

Despite providing a specific protocol for conducting evidence reviews on environmental issues, the CEE guide tends to attract studies from the natural and exact sciences, as seen not only in the guide's content (CEE, 2022) but also in the publications of the EEJ. It is a recurring situation worldwide when seeking to understand the comprehension of environmental sciences by institutions connected to knowledge production. For instance, the Encyclopedia Britannica (2022), the Journal of Environmental Sciences (JES, 2022), and EnvironmentalScience.org⁶ (ES, 2022) define environmental sciences as an interdisciplinary field that seeks to engage with the areas of exact and natural sciences to study environmental issues and the impacts of humans on the environment.

Brazil does not deviate significantly from this perception. In 2011, CAPES (2019) created the field of Environmental Sciences (CACiAmb) to organize, guide, and evaluate Graduate Programs (*Programas de Pós-Graduação*, PPGs) that study the environmental challenges arising from the interaction between anthropogenic and natural systems emerging from the contemporary world⁷. It "is included in the Multidisciplinary area, which, in turn, falls under the College of Exact, Technological, and Multidisciplinary Sciences" (CAPES, 2019, p. 2). Among the subareas of Environmental Sciences, the most common ones are "Technology, Modeling, and Geoprocessing," representing 77% of the PPGs in the country, and "Environmental Public Policies, Management and Planning", which represent 53%

of the programs. Following these, there are the areas of "Development, Sustainability, and Environment" and "Natural Resource Use", with 46% and 37% of the Brazilian PPGs affiliated to the field of Environmental Sciences (CAPES, 2019, p. 11).

Considering the college in which CACiAmb is located, as well as the two most numerous subareas of PPGs, there is prevalence of natural and exact sciences in addressing environmental studies in Brazil. Despite the inclusion of social studies in the field (subarea "Development, Sustainability and Environment"), it is evident that this is not yet a privileged field of analysis. There are also limitations in the evaluation criteria for the field of Environmental Sciences by CAPES, as the institution tends to use criteria more suitable for natural and exact sciences, as observed in the field's document (CAPES, 2019).

Such a scenario contributes to the invisibility of evidence review research that also addresses social, political, and cultural issues in the human-nature relationship. In other words, those studies that bridge the dialogue between social and natural sciences related to the socio-environmental field. The Encyclopedia Britannica (2022) itself acknowledges this distinction but refers to the field as environmental studies, distinguishing it from environmental sciences, by emphasizing the human relationship with the environment and its social and political dimensions. For Zanoni *et al.* (2018, p. 209-210):

As conceived, the environment fits within a broad representation that encompasses two subsystems

⁶ It is an organization that gathers information about education and job opportunities in the environmental field.

⁷ Prior to its creation, studies in the field were mainly concentrated in the Chamber of Environment and Agrarian Sciences within the Interdisciplinary Area (CAInter) (CAPES, 2019).

that interact and even share common elements but are organized according to different structural and dynamic properties. The Nature system comprises the set of biological and physico-chemical components that interact within the major domains of biological organization, such as the atmosphere, pedosphere, hydrosphere, and geosphere [...] The Society system comprises the set of elements and processes whose articulation participates in the organization, reproduction, and evolution of social relations and cultural phenomena [...].

Based on this understanding, the authors advocate for an interdisciplinary field of study to investigate “objects and dynamics at the interface [...] between the Nature system and the Society system, in the space where no understanding is possible without the simultaneous appeal to the properties of both systems” (Zanoni *et al.*, 2018, p. 210). In other words, Fernandes & Sampaio (2008, p. 89) establish a direct connection between the “crisis of the current paradigm” and the “crisis of the society/nature relationship” generated by humanity’s ongoing attempt to colonize the future and nature. This highlights the linkage between environmental issues and “socioeconomic problems and the capitalist way of life culturally rooted in today’s society” (Fernandes & Sampaio, 2008, p. 89), leading them to perceive this issue as “eminently social”. Indeed, addressing these issues requires the collaboration of disciplines from different realms, both social and natural, each possessing distinct objects of study, methods, and theories, in order to examine and address the socio-environmental problems of our contemporary world.

Given the limited visibility of the socio-environmental field and the focus of the integrative review, which seeks to gather and select studies with

different methodological natures and theoretical perspectives on a particular topic, we understand that this is the type of systematic literature review that best aligns with socio-environmental studies. In this context, the next section presents a proposal for conducting an integrative review applied to the socio-environmental field.

3. Integrative review for socio-environmental studies

Being systematic and protocol-driven, an integrative review should be conducted following clear and well-defined successive stages in order to reduce the risk of errors and biases in the selection and analysis of the studies to be included. For this work, six stages have been defined (Figure 2), adapted from the proposal by Botelho *et al.* (2011) and the CEE systematic mapping guide (2018):

It is worth noting that all stages should be described clearly and meticulously in the review, to enable not only the understanding of the work by readers but also the replication of the study (Botelho *et al.*, 2011). In light of this, we suggest that stages 1, 2, 3 and 4 form the methodological part of the review, while stages 5 and 6 constitute the results, discussion, and conclusion sections. However, it’s important to remember that the way these last two stages are conducted should be explained in the methodology section, and the research question and a brief explanation of the methodology should be included in the introduction of the work.

When conducting an integrative review on socio-environmental issues, it is important to have a multidisciplinary team involved in the work. It is unlikely that a single researcher possesses all the

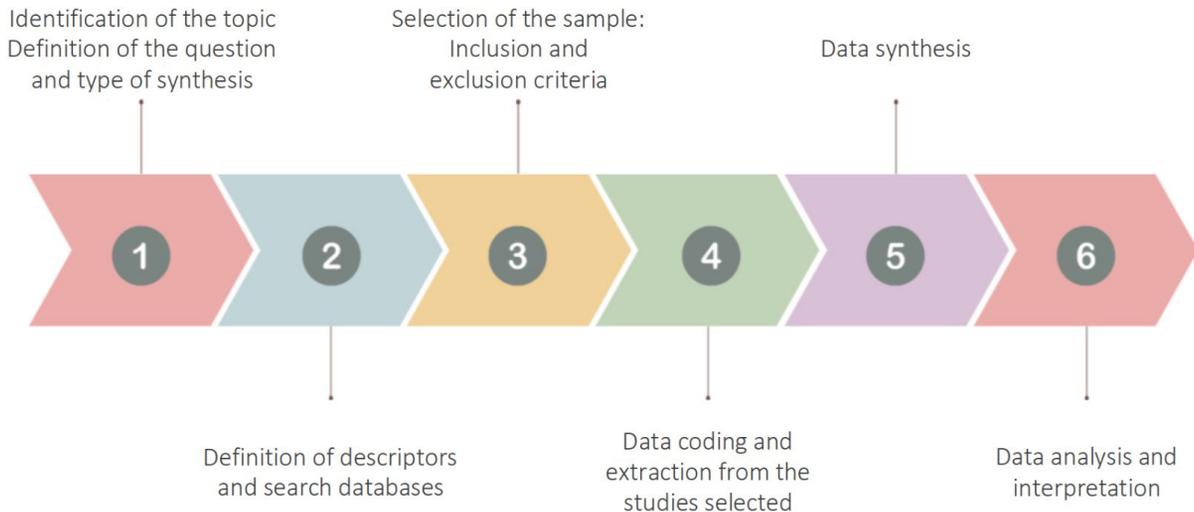


FIGURE 2 - Stages of an integrative review applied to socio-environmental studies.
SOURCE: Adapted by the authors from Botelho *et al.* (2011) and CEE (2018).

necessary skills and expertise (both conceptual and methodological) required to conduct all stages of the review. Furthermore, some stages may require the analysis or verification of two or more participants to reduce the risk of errors or introducing bias in the review process (CEE, 2018). In this regard, whenever possible, it is beneficial to have a representative from each dimension of the socio-environmental field (social and natural), which deepens the construction of interdisciplinary knowledge inherent to the area (Floriani, 2018; Raynaut, 2018; Zano- ni *et al.*, 2018). Additionally, having a librarian to assist, especially in the first two stages of the review (CEE, 2018), and later in the bibliometric analysis of the selected sample in the fourth stage (section 3.4.), can be valuable.

3.1. Research question

The initial stage in the process of creating an integrative review and evidence synthesis is defining the research question, which should be clear and specific (Botelho *et al.*, 2011). Defining the structural elements of the research question is of utmost importance to formulate a well-crafted question. Four key elements can be classified: the population of interest (P), the exposure or intervention of interest (E or I), the comparator (C), and the outcomes of interest (O) (CEE, 2018). Many socio-environmental studies do not have a comparative nature, making the comparator element (C) optional in such cases.

The population of interest, as per CEE (2018), refers to the unit of study where the exposure or intervention will be applied. This can be represented,

for example, by an ecosystem, a species, a management approach, or a social subject. The exposure or intervention is the action or variable to which the population is exposed. This can include protected areas, herbivory by a certain animal, an agricultural system, the type of populated area (e.g., urban or rural), or a socio-political, economic, or cultural context. The comparator, when present, represents the counterfactual scenario of the study object, exemplified as the presence or absence of some factor. The outcomes of interest (outputs) constitute relevant outcomes of environmental exposure or intervention that can be measured reliably (CEE, 2018) or verified through social research.

As an example, Mansani (2022) formulated the question using the PEO combination, without the need for the comparator item. For the population of interest (P), he named Agroforestry Systems (AFS); for exposure (E), he used Mixed Ombrophilous Forest (MOF); and for outcomes (O), he considered the management and design of the system, resulting in the following research question: “What are the designs and management practices of Agroforestry Systems in the Mixed Ombrophilous Forest?”

3.2. Definition of descriptors and search databases

Based on the definition of the question, it is possible to define the search descriptors and their combination using Boolean operators (AND, OR,

NOT)⁸, due to the ability of these operators to form logical functions. With them, it is possible to group the search terms into blocks, known as search strings (CEE, 2018), by selecting from those present in the elements of the PE(C)O framework, as defined in the previous step, which facilitates the structuring and revision of the research.

To refine the selection of these descriptors, it is possible to consult a Thesaurus⁹, such as ThesBio from BHL/SciELO, which is focused on natural sciences, and the microthesaurus on environmental management (Vasconcelos Sobrinho *et al.*, 2015), covering the social area, both from Brazil. Alternatively, you can also refer to some international references, such as the IEEE Thesaurus from Advance Technology for Humanity, Ei Thesaurus from Elsevier, and the UNESCO Thesaurus from the United Nations Educational, Scientific and Cultural Organization (UNESCO). Furthermore, we suggest that the terms in the search string be in the researchers’ native language and in English, or only in English, as scientific databases often include or limit the indexing of their content to the Anglo-Saxon language. If two languages are used, the descriptors should be included in the search string with their translation following them, separated by the Boolean operator OR.

The CEE (2018) explains that by combining descriptors in search strings, it is possible to retrieve as many relevant results as possible (comprehensiveness), while simultaneously limiting the number

⁸ For more information on the operation of boolean operators or the construction of search strings, please refer to Picalho, A. C.; Lucas, E. R. de O.; Amorim, I. S. “Lógica booleana aplicada na construção de expressões de busca” (Boolean logic applied in the construction of search expressions). *AtoZ: novas práticas em informação e conhecimento*, 11, 1 - 12, mar. 2022. e EBSCO Connect. *Pesquisa com operadores booleanos*. Available in: https://connect.ebsco.com/s/article/Pesquisa-com-Operadores-Booleanos?language=en_US.

⁹ It is a set of terms with semantic and generic relationships within a specific area of knowledge, facilitating the indexing and retrieval of information in bibliographic databases, whether physical or digital.

of irrelevant results (precision) related to the defined research question. However, search strings are often modified after their initial development, usually simplified to accommodate the functionality of each electronic bibliographic database used in the review, as the search algorithm of each database rarely repeats itself (Haddaway *et al.*, 2015). To make these adjustments, it is necessary to consult information about the search syntax of each database (a set of symbols provided by the databases, used in the search strings to convey the intended search¹⁰), typically found in the help pages, including details on the limitations of using Boolean operators (Haddaway *et al.*, 2015; CEE, 2018). The search syntax and the modifications made to the search string to adapt it to each database should be documented and reported in the research paper, along with the search filters used in each one (e.g., search period, author, location of term search in the manuscripts, or field of knowledge, etc.).

Regarding these filters, typically two of them are used: the search period, which refers to the range of publication years of the materials to be retrieved, and the location of descriptor search within the documents, with the most commonly used option being searching in the “title, abstract and keywords”. Regarding this last filter, depending on the database, it may be presented differently, such as “Topic” in the Web of Science Core Collection (2022) or “Article title, abstract, Keywords” in Scopus (2022). And it may not even exist at all, as is the case with the gray literature database Google Scholar (2022), which restricts searches to the title

or full text. Therefore, reviewers should learn to navigate the different selected databases to understand, in addition to the provided search syntax, the options and locations of their filters.

A typical example of modifying the search string and restricting search filters due to interface limitations is Google Scholar. The few filters it provides are only fully presented in the advanced search option. Furthermore, it is not transparent about its search algorithm, it cannot recognize all Boolean operators in long search strings, and it has limitations in terms of replicability¹¹ (Haddaway *et al.*, 2015; Faria, 2022; Google Scholar, 2022; Mansani, 2022).

Regarding the search databases, it is possible to classify them into two major groups, as suggested by Haddaway *et al.* (2017) and Mansani (2022): databases and/or scientific journals, which typically include peer-reviewed articles, often following the double-blind peer-review system, providing greater reliability and scientific rigor to the findings of these manuscripts; and grey literature databases, encompassing works not subject to peer review.

The Grey Literature includes documents not published by commercial publishers and that have not undergone a higher degree of scientific rigor evaluation, but they can constitute a vital component for evidence reviews (Haddaway *et al.*, 2015; Silva, 2022). Despite the questionable scientific rigor of these documents, grey literature should be included in evidence synthesis as a supplementary source for two reasons: to attempt to minimize potential bias and to encompass studies not intended for the aca-

¹⁰ For example: wildcard or truncation characters (*, ?, \$), the use of parentheses to group search terms to determine a sequence, searching for compound terms using “”. The databases differ in terms of the syntax they allow (Haddaway *et al.*, 2015; CEE, 2018).

¹¹ In the sense that it can yield inconsistent results when the search is performed on different computers or even by the same computer at different times or on different days.

demic domain, such as reports, procedures, theses, dissertations, monographs, proceedings, newsletters, technical notes (Haddaway *et al.*, 2015; CEE, 2018). Google Scholar is an example of such a database, which, according to Haddaway *et al.* (2015) and CEE (2018), despite not being recommended for independent use or as a substitute for scientific databases in evidence reviews, remains a valuable tool for complementing bibliographic searches.

The choice of databases and journals should consider the research field, the types of documents, and the geographic region of the studies that researchers wish to include in the review, as well as the scientific publishing landscape of each country. For example, one scientific database in which many Brazilian journals are indexed is SciELO. The Web of Science Core Collection (2022) is an internationally recognized multidisciplinary scientific database. The *Portal de Portales Latindex* (PPL) is a scientific database focused on open-access publications of Ibero-American journals (PPL, 2022). The *Red de Revistas Científicas de América Latina y el Caribe, España y Portugal – Redalyc* (2022) is a multidisciplinary database that is also Ibero-American, but it stands out for the number of indexed social sciences journals. The *Biblioteca Digital Brasileira de Teses e Dissertações* (BDTD) has a larger collection and is updated more quickly than the *Catálogo de Teses e Dissertações da CAPES*, in addition to providing users with a link to access the complete works, whereas the CAPES Catalog only offers abstracts (BDTD, 2022; CAPES Panel, 2022).

In the socio-environmental field in Brazil, two national scientific journals stand out: *Desenvolvimento e Meio Ambiente* and *Ambiente e Sociedade*, due to the scope and quality of the articles they publish. In addition, there are websites that provide digital proceedings of conferences in the field, such as those created by: National Meetings of the National Association of Graduate Studies and Research in Environment and Society (*Encontros Nacionais da Associação Nacional de Pós-Graduação e Pesquisa em Ambiente e Sociedade*, ENANPPAS), Congresses held by the Latin American Association of Sociology (*Associação Latino-Americana de Sociologia*, ALAS), Congresses held by the Brazilian Society of Economics, Administration and Rural Sociology (*Sociedade Brasileira de Economia, Administração e Sociologia Rural*, SOBER), National Meetings of the Network of Rural Studies, and Brazilian Congresses of Agroecology (*Congressos Brasileiros de Agroecologia*, CBAs).

The search results of documents in the databases should be saved for the elaboration of the next steps. Some databases allow these results to be saved in online libraries linked to user accounts and/or in xls or csv files and/or in bibliographic information files (e.g., rif or RefWorks) that can be read by reference management programs such as Mendeley, Zotero, EndNote, Publish or Perish (PoP)¹², or Rayyan¹³. In these programs, it is possible to manage the results of searches performed through various actions, such as creating a folder for these documents, removing duplicate files, supplementing bibliographic information for selected documents,

¹² It provides bibliometric analyses of various bibliographic databases, including Google Scholar (Harzing, 2007). Through PoP, it is possible to export the results to a Microsoft Excel spreadsheet, facilitating the tabulation and organization of data from retrieved documents.

¹³ Unlike the other mentioned programs, this is a program specifically designed to support the conduct of systematic literature reviews. (Ouzzani *et al.*, 2016).

exporting selected documents to programs that generate bibliometric data graphs (as will be discussed in section 3.4), among other possible actions. The system used to organize search results, whether in a reference management program or in Microsoft Excel, should be documented in the research paper.

3.3. Selection of the sample: inclusion and exclusion criteria

After retrieving documents from the selected databases, duplicates are identified and removed, followed by the initiation of the screening of works based on the established eligibility criteria (inclusion and exclusion criteria). This selection should be carried out by at least pairs of researchers to avoid bias and clarify any potential doubts that may arise during the screening process. The specifications need to be defined precisely, and all key elements of the question (PEO/PECO/PICO) should be considered, as they will guide the screening of results in a manner aligned with the objectives of the review (CEE, 2018).

Continuing with the example from Mansani (2022), based on the author's PEO question, the following inclusion/exclusion criteria were defined: studies that addressed AFS located in the MOF or in municipalities with this vegetation were included, as well as research with information on the designs and/or management of these systems. Thus, studies that analyzed other types of systems and/or did not provide information on the designs and/or management of AFSs in the MOF were excluded.

The use of inclusion and exclusion criteria should be carried out in two stages. After removing duplicate works, an evaluation of the manuscripts'

titles and/or abstracts is performed to exclude documents that do not meet the established criteria in the first stage. In the second stage, a further assessment of the remaining full-texts is conducted, removing those that also do not align with the established parameters. Documents that do not allow access to the full text or are unavailable are also excluded at this stage.

This sequence of selection is based on what is proposed by the flow diagram of the RepOrting standards for Systematic Evidence Syntheses (ROSES), as required by EEJ (2021) and indicated in the CEE guide (2018). It allows for the quick identification of key information in the selection of (socio)environmental evidence reviews, increasing the reliability of the research, as it reports the step-by-step process of document screening (Haddaway *et al.*, 2017; 2018). Figure 3 presents the *template* of this diagram, which we suggest using in integrative reviews applied to socio-environmental studies:

As indicated in Figure 3, it is still possible to include in the sample selected documents from other sources that are not related to the integrative review but have come to the authors' knowledge through other means and will enhance the review's quality. It is worth emphasizing that this inclusion should consider the reliability of the information through a theoretical and methodological analysis of the manuscripts and their sources.

At the end of this process, the scientific papers that align with the established criteria are included in the analyzed sample and subsequently subjected to coding and data extraction (Lovato *et al.*, 2018; Borges *et al.*, 2020).

ROSES Flow Diagram for Systematic Maps. Version 1.0

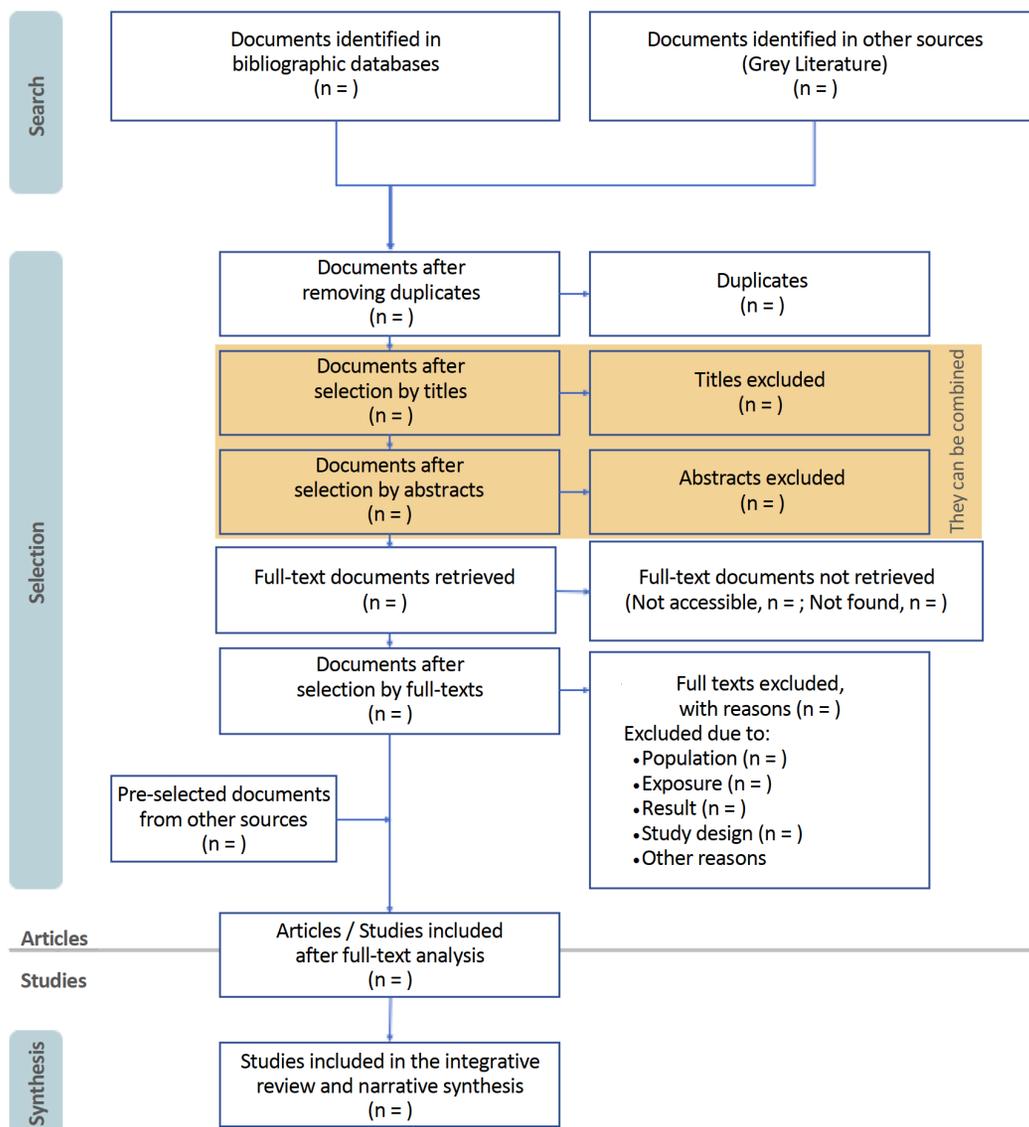


FIGURE 3 - ROSES Flow Diagram Template¹⁴.

SOURCE: Haddaway et al. (2017, free translation).

¹⁴ The ROSES website provides both an editable template in PPT format and an online fillable flow diagram that can be downloaded as an image after completion. Access both of them at: <https://www.roses-reporting.com/flow-diagram>.

3.4. Data coding and extraction from the studies selected

This stage aims at summarizing the relevant information extracted from the selected papers in the previous phase, and its format should be discussed and agreed upon by the review team. Data coding involves recording relevant characteristics (meta-data) of the studies, including bibliometric information (when, where, and by whom the study was conducted and carried out, where it was published, etc.) (CEE, 2018; Faria 2022; Mansani, 2022). Data extraction refers to the recording of the results from studies that answer the integrative review question (CEE, 2018). For the socio-environmental field, this process involves creating analytical categories developed in light of the review question to organize the information from the analyzed studies that address this question, as can be seen in the studies by Faria (2022) and Mansani (2022) and in the educational material by Silva (2022).

Both processes - coding and extraction - can be understood as a synthesis or analysis matrix proposed by Botelho *et al.* (2011), meaning a method that organizes data reflecting the characteristics and variables of the analyzed studies. According to the CEE guide (2018), there is a frequent interactive

relationship between data coding and extraction, and they are often conducted together.

We suggest that this data be tabulated and organized in two Microsoft Excel spreadsheets, one for coding and another for data extraction, where variables and/or characteristics and analytical categories will be defined by the review researchers for subsequent data collection in each analyzed study (CEE, 2018; Faria, 2022; Mansani, 2022; Silva, 2022). Due to each review being different, the information to be incorporated into the spreadsheets will vary to address the specificities of the review problem (CEE, 2018). This variation also arises from the interpretation and the way the review team organizes the data (Botelho *et al.*, 2011). However, there are similarities in some types of information that are important to include in systematic literature review studies, making it possible to adapt data coding and extraction from one review to another (CEE, 2018). As an example, Figures 4 and 5 present a coding spreadsheet and a data extraction spreadsheet, respectively.

Regarding Figure 4, there is still the possibility of encoding additional information beyond what is presented, such as the authors' affiliation institution, the country of publication of the article or thesis (of the journal or the educational institution), keywords,

	TITLE	Authors	Journal/HEI	Course/PP	Type of publicati	YEAR	Language
1	Sistema agroflorestal de Lima da Pérsia (<i>Citrus limetta</i>): estudo de caso no município de São Domingos do Sul (RS)	FOSCHIERA, JDW	UFFS	Agronomy	Monograph	2018	Portuguese
2	Sistemas agroflorestais: restauração ambiental e produção no âmbito da Floresta Ombrófila Mista	RADOMSKI, MI; LACERDA, AEB de; KELLERMANN, B	Embrapa Florestas		Technical communication	2014	Portuguese
3	Planejamento de um sistema agroflorestal multiestrata para recomposição de floresta ciliar no Paraná	PEREIRA, H; GOMES, GS; MAZZA, MCM; MUSSIO, CF; RUIZ, ECZ	Embrapa Florestas		Book chapter	2013	Portuguese

FIGURE 4 - Example of an Excel spreadsheet for coding data from an integrative review on the management and design of agroforestry systems in the Mixed Ombrophilous Forest.

SOURCE: Mansani (2022).

State	Municipality	Area	Year	Agroecological	Macro-system type	Micro-system type	Objective of the system	Species	Spacing	Management
RS	São Domingos do Sul	0.96	2000	Yes	Agroforestry	Enriched forests	Commercial	<i>Citrus limetta</i> (Limeira); <i>Acca selowiana</i> (O.Berg) Burret (Serrana Guava); <i>Ilex paraguariensis</i> (Yerba mate) and <i>Eucalyptus</i> spp. (Eucalyptus)		Manual
SC	Caçador	1	2011	Yes	Agroforestry	Alley Cropping	Environmental Regeneration	<i>Araucaria angustifolia</i> (Araucaria); <i>Ilex paraguariensis</i> (Yerba mate); <i>Mimosa scabrella</i> (Bracatinga); <i>Vicia sativa</i> (Vetch); <i>Lolium multiflorum</i> (Ryegrass)	Bracatinga: 6m x 1.5m (1,111 trees per hectare). Yerba mate: 3m x 1.5m	Mechanized and Manual
PR	Palmeira	0.1	2011	Yes	Agroforestry	Random Mixed Crops	Environmental Regeneration	<i>Araucaria angustifolia</i> (Araucaria); <i>Campomanesia xanthocarpa</i> (Guabirova); <i>Eugenia uniflora</i> (Surinam cherry); <i>Schinus terebinthifolius</i> (Brazilian pepper tree); <i>Myrsine</i> sp. (Capororoca); <i>Psidium cattleianum</i> (Strawberry guava)	5 lines of 500m. Spacing of 2m X 2m. 1,250 seedlings planted. 15 forest species. Fruit trees with spacing 4m x 4m.	Mechanized

FIGURE 5 - Example of an Excel spreadsheet for data extraction from an integrative review on the management and design of agroforestry systems in the Mixed Ombrophilous Forest.

SOURCE: Mansani (2022).

data about the elements of the research question (regarding population - P, type of exposure - E, and generated outcomes - O), and data on the methodology of the retrieved works (nature of the research, type of research, universe and sample, research location, and data collection tools used) (CEE, 2018; Silva, 2022). For data extraction as exemplified in Figure 5, authors should plan the amount of information to be collected to avoid either excessive or insufficient data collection. It is important to extract data that reflects points of convergence and differences that may affect the synthesis and interpretation of results (CEE, 2018).

3.5. Data synthesis

The narrative synthesis can be considered part of the presentation of the results of an integrative review. Through narrative synthesis, the characteristics of the selected studies in the review are tabulated and/or visualized to present the context and the landscape of distribution and abundance of the evidence found regarding the studied socio-environmental problem (CEE, 2018). It represents the

descriptive part of the body of evidence identified, using figures (visualization) and tables (tabulation) created from the coding and data extraction performed in the previous stage (CEE, 2018; Mansani, 2022).

The presentation of data in figures and tables can vary from a simple spreadsheet to innovative forms of data visualization (CEE, 2018). The most common form used is charts and tables generated by Microsoft Excel, but depending on the information authors wish to analyze, the use of other software programs is possible. For instance, the VOSviewer software can be used for co-citation, co-authorship, and term recurrence analysis in titles and abstracts of studies (Van Eck & Waltman, 2010), provided that data from the analyzed studies are incorporated into the program through bibliometric files, which is facilitated by the use of reference management programs.

Another possibility is the use of the online program wordclouds.com, which generates word cloud figures, where words from the titles and/or abstracts of the studies selected in the review appear hierarchically according to their frequency

(Faria, 2022; Mansani, 2022; Silva, 2022). For review studies aiming to identify evidence gaps, it is possible to use the Evidence Gap Map (EGM) model. It is a matrix of cross-referenced variables that graphically maps the gaps, demonstrating little or no data or research on a particular topic (Snilstveit *et al.*, 2016)¹⁵.

Based on our experience in conducting integrative reviews in the socio-environmental field, we have observed that, despite these programs facilitating the synthesis of data from the coding and extraction processes, they tend to concentrate more data from the coding process (Faria, 2022; Mansani, 2022; Silva, 2022). The data from the extraction, which in the socio-environmental field tends to have a more qualitative nature, are synthesized into analytical categories, and their content is typically analyzed textually (Silva, 2022). Given the more qualitative nature of the field, Bardin's (2011) proposal is a good option for organizing the data in this analysis. According to the author, three stages need to be carried out: the first two correspond to the data extraction work, as seen in the previous stage, as they organize (1) and code into record units (2). The last stage can be understood as the synthesis of results (3), where the results are categorized, meaning they are classified based on their similarities and differences, with subsequent regrouping due to common characteristics.

3.6. Data analysis and interpretation

This stage forms part of the presentation and discussion of the results and the conclusion of the integrative review. In this stage, the aim is to describe and discuss the results found in order to present reliable evidence to answer the review question and identify existing knowledge gaps (Botelho *et al.*, 2011; CEE, 2018; Silva, 2022). To do so, it is necessary to blend the description and narrative analysis/interpretation with the presentation of frequency tables and charts created in the previous stage, thus allowing, according to Souza (2010), comparisons between all selected studies, the identification of patterns, and differences in characteristics or categories.

In the discussion of the results, there are the main findings that impact the accumulation of existing knowledge on the researched topic, the practical implications of the evidence found, and the knowledge gaps present (Botelho *et al.*, 2011; CEE, 2018). However, it should not be forgotten that in the socio-environmental field, local physical, biological, sociological, cultural, and economic specificities can limit attempts to generalize the new knowledge generated. Therefore, it is important to contextualize these findings when discussing them.

In the conclusion, it is important not to forget to mention the need for further research or advancements related to the socio-environmental topic studied based on the generated results (Botelho *et al.*, 2011; CEE, 2018). According to the CEE

¹⁵ Other good examples of data visualization can be found in: i) Fagundes, C., Schreiber, D.; Nunes, M. P. A certificação FSC em publicações científicas internacionais disponíveis na Science Direct e Scopus. *Desenvolvimento e Meio Ambiente*, 59, 296-318, 2022; ii) Brites, A. D.; Mor-sello, C. Efeitos ecológicos da exploração de produtos florestais não madeireiros: uma revisão sistemática. *Desenvolvimento e Meio Ambiente*, 36, 55-72, 2016; and iii) Haddaway, N. R.; Styles, D.; Pullin, A. S. Evidence on the environmental impacts of farmland abandonment in high altitude/mountain regions: a systematic map. *Environmental Evidence*, 3, 17, 2014.

guide (2018), this recommendation can be made through a simple report of knowledge gaps, but it should include recommendations regarding the design of future studies that will generate sufficient quality to improve the evidence base and reduce uncertainty around the research question.

4. Final considerations

In this paper, we argue that the integrative review is the most suitable type of systematic literature review for systematic studies in the socio-environmental field, due to its ability to include studies with different methodological, theoretical, and hypothesis-based approaches in the document selection, capable of answering a question that articulates the relationship between society and nature. Due to the lack of bibliographies guiding researchers on how to conduct this review, as well as the increasing trend of systematic studies in the socio-environmental field, we present in this article a proposal on how to conduct such a review, taking into account the specificities of the field.

Providing a reference for the socio-environmental field for the production of such reviews enhances the rigor and quality of works applying this method. This allows authors to consult a source that gathers, details, and guides all the necessary steps in the process of systematically reviewing evidence in the socio-environmental field.

It is a method that can also be used as a tool for interdisciplinary practice, as the inherent interdisciplinary nature of the socio-environmental field encourages its execution by a team composed of members with different backgrounds, including both natural and social sciences. Furthermore, by

requiring interaction within the team, from formulating the question to interpreting the results, it brings different knowledge into dialogue, with the potential to generate integrative reviews with innovative methods and findings for the field.

It is worth noting that teamwork requires social skills among its members, who, by recognizing each team member's working style and competencies, have the ability to find ways to complement the necessary review activities. For example, some professionals may excel in writing and data interpretation activities, while others may be better at tabulation and systematization of data. It is natural for professionals to dedicate more time to review activities in which they excel.

In conclusion, the intended dissemination of the method proposed here has the potential to aid in the organization and dissemination of socio-environmental knowledge, which, in turn, contributes to the strengthening of the field in the country. As a result, by achieving greater visibility, the socio-environmental field has the capacity to advance its consolidation within Higher Education Institutions and in the face of educational assessment bodies in the country.

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