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Taking Stock of Land Use Conflict Research: A Systematic Map with Special Focus on Conceptual Approaches

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ABSTRACT

The literature on land use conflicts has significantly increased in number in recent years, and keeping track has become challenging. Moreover, "land use conflict" is a rather fuzzy concept; a coherent understanding of what it encompasses is presently missing. Thus, the objective of this paper is to provide an overview of the current state of land use conflict research, with a special focus on different conceptual approaches. A systematic mapping of 306 scientific, peer-reviewed publications on land use conflicts was conducted, combined with an interpretive analysis of how the term "land use conflict" is used. This revealed an extensive research field with several well-covered subfields but also some knowledge gaps. Moreover, four different conceptual approaches that have been applied in the literature were identified. The paper thus contributes to the formulation of an evidence-based research agenda and to an improved conceptual understanding of the term "land use conflict."

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Introduction

Humans use land for many different purposes, such as food or energy production, housing, resource extraction, and the provision of environmental services. However, many of these land uses[1] are mutually exclusive or negatively impact each other (Jensen, Baird, and Blank 2019). For example, nonresidential land uses, such as industrial or commercial areas, landfills, or transport infrastructure can negatively impact nearby residential areas due to noise, odor, health risks, or visual blight (Tudor et al. 2015). Agriculture and settlements are examples for mutually exclusive land uses that often compete for the same land (Gottero 2019). As the amount of land that is globally available is limited (Mann et al. 2018), conflicts about which land should be used for which land uses inevitably arise. These land use conflicts will likely further increase in numbers and severity as the global population grows, higher standards of living raise individual land consumption, and climate change and environmental degradation reduce the amount of suitable land (Hersperger et al. 2015; IPCC 2019; Rodríguez

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García et al. 2020). A thorough understanding of land use conflicts will therefore become ever more important for anyone occupied in fields related to land use.

Recognizing this need, scholars have conducted a wealth of studies on land use conflicts over the past decades, and an extensive body of literature has developed. This is encouraging but has created new challenges. For one, keeping track of this rapidly expanding knowledge has become difficult, especially since few reviews thus far synthesize the existing findings and an overview of the broader research field is missing. Moreover, "land use conflict" is a rather fuzzy concept; there is no coherent understanding of what it encompasses (Sinthumule 2016; Ma et al. 2020). Steinhäußer et al. (2015) observe that the definitions that are presently in use disagree on whether the term refers to predominantly social or spatial issues. Likewise, Zhou et al. (2019) distinguish works regarding "interest conflicts" among stakeholders from those addressing "spatial conflicts" between land use functions. There seem to be different conceptions regarding who or what is in conflict in land use conflicts. Indeed, Harrison and Loring remark that research in the field has been "effective but siloed" with "multiple lines of research on conflict, each with their own specific ontological framings" (2020, 1). No attempt has been made to systematically analyze the conceptual approaches used in land use conflict research, yet familiarity with the different approaches is crucial to avoid misunderstandings and a precondition for the synthesis of findings.

Against this backdrop, the objective of this paper is to provide an overview of the current state of land use conflict research, with a special focus on conceptual approaches. To accomplish this, this paper presents the results of a systematic mapping of the literature on land use conflicts. Systematic mapping is a methodology adapted from systematic review methods that allows us to describe research fields that are too broad for reviews. Instead of synthesizing results, systematic maps outline the topics that have been covered. They can thus identify knowledge gaps that need more primary research but also narrower knowledge clusters within the broader research field that are well-covered and merit reviews (James, Randall, and Haddaway 2016). Systematic maps, therefore, lay the groundwork for future, more detailed analyses within the identified themes. Moreover, systematic mapping has been identified as a suitable tool to structure conceptual diversity (Németh et al. 2021). Similar to the methodological approach applied by Németh et al. in their systematic mapping of the "geoconservation" literature (2021), this paper combines the systematic mapping method with an interpretive analysis of how the term "land use conflict" is used in scientific papers. The paper thus identifies different types of conceptual approaches, bringing some more clarity into the fuzzy concept of "land use conflict."

Hence, the paper answers the following research questions:

1. What has been studied by research on land use conflicts? What are well-covered subfields that merit reviews or synthesis (knowledge clusters)? Where are knowledge gaps?
2. Which conceptual approaches are in use, and how can they be distinguished?

Materials and Methods

This section first describes the methodology of the systematic mapping and then the method for the interpretive analysis of the conceptual approaches. The report of the

mapping process was created following the ROSES for Systematic Map Reports guidelines (Haddaway et al. 2017, 2018). The resulting ROSES checklist has been deposited with the dataset (available in Fienitz 2022) and a ROSES flow diagram is available in Supplementary Appendix A; they provide additional details.

Selection of Included Publications

Search

The mapping focuses on scientific, peer-reviewed publications that empirically or theoretically deal with land use conflicts. Publications were searched in the databases Scopus and Web of Science on several dates between 2020 and 2022. The search terms "land use conflict*," "land-use conflict*," "conflict* over land use," or "conflict* over the use of land" were used, and then "conflict" was replaced by the following synonymous words (identified through the Thesaurus function of Cambridge Dictionary and thesaurus.com): dispute, incompatibility, competition, struggle, controversy. See the search strings for Scopus and Web of Science in the ROSES checklist (Fienitz 2022). Further synonyms of "conflict" (disharmony, rivalry, clash, and quarrel) were also tested but yielded no results. Related but distinct fields, such as research on "land conflicts" are not covered. Moreover, no alternative terms for "land use" were used in the search, because many related broader or narrower terms were detected, but no synonyms. The vast number of related terms makes it impossible to include all of them in the search ("conservation conflict" (Davies, Bryce, and Redpath 2013), "farmer-herder conflict" (Walwa 2020), "NIMBY conflict" (Jin et al. 2022), and "siting conflict" (Schelly et al. 2020) are just a few examples of the different types of related terms that are in use), yet including only some narrower terms would introduce a bias. Thus, this mapping focuses on publications that use the general term "land use conflict," or a synonym for "conflict." The search was limited to article titles, author keywords, and index terms to focus on publications that deal with land use conflicts in some depth. Furthermore, it was limited to articles and reviews published in English between 2005 and 2020, restricting the mapping to the recent international literature. These search criteria generated 610 results. Twelve of these were excluded during the screening of titles, abstracts, and metadata because they did not match the search criteria (i.e., book chapters, and articles in languages other than English). The full text was accessible for 586 of the remaining publications (Supplementary Appendix A: ROSES flow diagram).

Article Screening

To allow an analysis of how the term "land use conflict" is used, the mapping was limited to publications in which the authors themselves use the term or any of its synonyms as named above. Publications for which the search terms only appeared in the algorithm-produced index terms but nowhere else in the paper were excluded. In contrast, publications that used a search term in the author-produced keywords but then used an alternative term in the body of the paper were included, as the authors' decision to name the term in the keywords indicates that they consider the issue as a type of land use conflict. Finally, any publications that referred to land use conflicts merely as the context of their study were considered unsuitable to answer the research

questions and were excluded. This procedure resulted in 306 publications that were ultimately included in the mapping. A list of all excluded publications with reasons for exclusion and the final dataset with all included publications are provided in the data publication (Fienitz 2022).

Analysis of Publications

Regarding Research Question 1: Overview of What Has Been Studied by Research on Land Use Conflicts

To generate an overview of what has thus far been done in land use conflict research, the following variables were analyzed: search term(s) detected in the databases ("land use conflict," "land use competition," etc.), year of publication, subject area, methodological approach, research aim, land use issue regarded in the studies, and geographical region(s) covered (subdivided into the variables continents, countries, and whether the study was limited to a smaller, subnational region). The year of publication was extracted directly from the databases, along with other metadata, such as author names, titles, and keywords, using the R package bibliometrix in its web-interface biblioshiny (Aria and Cuccurullo 2017). The detected terms, subject area, methodological approach, research aim, land use issue, and geographical region(s) were coded manually. Subject areas were coded according to the classifications provided by Scopus or Web of Science. Coding of research aims and land use issues followed an inductive logic: they were first coded using the wording of the respective publication and then clustered into broader categories to generate an overview of the research field's topics (see all categories with explanations in the code book in Fienitz 2022). All results were combined using descriptive statistics (Bortz and Schuster 2010), and in a second step, relations between selected results were examined, for example, if the land use issues that the literature covered differed by continent and how research aims evolved over time. Underrepresented research aims, land use issues, and geographical regions were identified as knowledge gaps, while those with a high number of publications were identified as knowledge clusters.

Regarding Research Question 2: Interpretive Analysis of Conceptual Approaches

To determine the different conceptual approaches that exist in the land use conflict literature, the mapping as described above was continued with two additional variables: the explicit definitions of "land use conflict" and the use of the term throughout each publication. For the latter, a type-building text analysis (Kuckartz 2014) was conducted. As a preparatory step to type building, all passages indicating what the authors conceive as a land use conflict were marked in each publication. Such passages included explicit definitions and other references to the term. Each passage was coded according to who or what was in conflict in that passage, i.e., whether it referred to actors in conflict, to competing land uses, etc. (thematic analysis). By clustering those codes where the same kinds of elements were in conflict, different types of conceptual approaches were identified (type-building analysis). As one study can apply multiple approaches, all types that had appeared in one publication were listed as the publication's conceptual approach(es) (Figure B.1 in Supplementary Appendix B). Finally, relations between the conceptual

approach types and other variables from the mapping were analyzed to determine if certain approaches were more common in particular types of studies.

Results

Overview of What Has Been Studied by Research on Land Use Conflicts

Systematic mapping revealed an extensive research field that has covered a wide range of issues. Recent years show a marked increase in the number of publications, with a peak in 2017 at 39 new publications, confirming the initial notion of a rapidly expanding body of knowledge (Figure B.2 in Supplementary Appendix B). The evidence collected here does not indicate possible reasons; however, land is subject to increasing pressures and more diverse demands, which likely has spurred interest in the resulting land use conflicts (Hersperger et al. 2015). The term "land use conflict" (in any of the four ways of writing as depicted in the Methods section) was by far the most commonly used; 262 of the mapped publications were detected in the databases through this term. "Land use competition" was the second-most common, with 34 publications. Few publications were found through the terms "land use dispute" (nine), "land use incompatibility" (three), "land use controversy" (two), and "land use struggle" (one). Most publications stem from the Environmental or Social Sciences, with Agricultural and Biological Sciences being the third-most important contributor (Figure B.3). The subject area "Energy" featured a particularly large share of studies that used the term "land use competition," while the term "land use dispute" was almost exclusively found in publications based in the Social Sciences (Table B.4). Thus, there seem to be some differences in terminology depending on the scientific discipline. The different methodological approaches and the geographical distribution of studies are depicted in Figure B.5 and Figure 1. The share of each methodological approach has remained relatively stable over the time period analyzed here, with modeling having become somewhat more important in recent years, possibly indicating a trend toward more prognostic research (Figure B.6). Asia, South/Central America, and Africa have seen a considerable increase in research interest recently (Figure B.7).

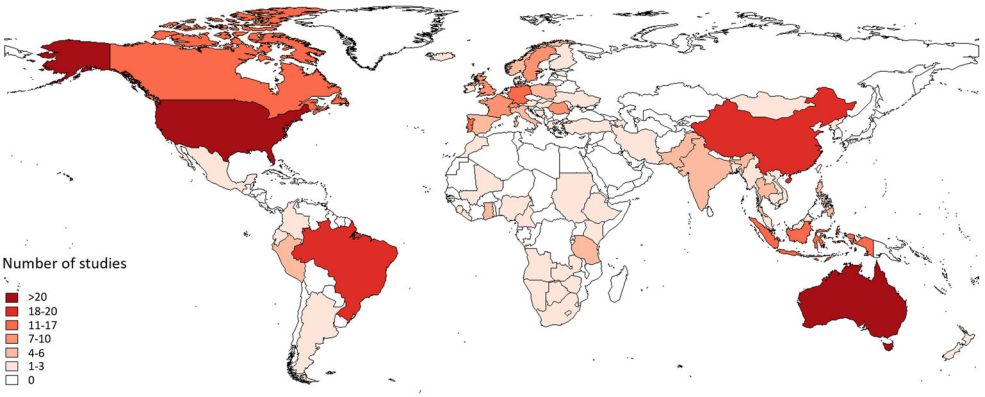

Figure 1. Geographical distribution of studies. The map shows how often each country was covered by studies on land use conflicts.

In terms of content, a wide range of land use issues have been addressed: clustering resulted in 15 different issues that are covered repeatedly (Figure B.8). However, as Figure B.9 depicts, their geographic distribution varies. The range of different research interests that have been followed is also extensive; clustering produced 12 broad aims pursued in the land use conflict literature (Figure B.10). While some aims, in particular research on tools, methods, and strategies to manage conflicts, were prominent from the beginning of the time period covered here, other aims, such as analyzing the consequences of land use conflicts or analyzing and explaining conflict dynamics, have only recently gained popularity, indicating diversification of research interests (Figure B.11). Moreover, different research aims have been prioritized in different geographical regions (Figure B.12).

Knowledge Clusters

The systematic mapping revealed several well-covered subfields that merit reviews or synthesis of results. Europe is by far the most frequently studied continent, with 111 publications (Figure B.13). Australia and the United States are the highest-ranked countries (26 studies each), followed by Brazil and China (20 studies each), and Canada (16 studies) (Figure 1). It seems improbable that these regions suffer more from land use conflicts than others; instead, the distribution of studies likely reflects the amount of resources that are available for this kind of research in different countries. Cultural differences might also play a role; not all cultures are inclined to openly discuss conflicts. Nevertheless, as these regions offer a broad research body, meta-analyses that gather knowledge about land use conflicts in Europe or in the most frequently studied countries might be fruitful.

Regarding land use issues, knowledge is clustered around conflicts concerning agriculture (98 publications), conservation/protected areas (72 publications), and settlement/urban land uses (58 publications). Studies on conflicts that involve agriculture often address land use competition between agriculture and other land uses, particularly conservation (i.e., Marr, Howley, and Burns 2016; Talerngsri 2020), as well as conflicts between agricultural actors and other local actors, especially pastoralists (i.e., Abegunde, Alawode, and Sibanda 2020). The studied conservation conflicts frequently take place between the local population and managers of protected areas (i.e., Kovács et al. 2015; Phromma et al. 2019). Studies on conflicts involving settlements and urban land uses recurrently address urban sprawl (i.e., Ma et al. 2020) but also a wide range of urban development projects, from affordable housing (Davison et al. 2016) to revitalization of abandoned urban space (Ianoş et al. 2014). Considering the significant number of publications on these three land use issues, reviews that synthesize findings for each of them are promising. Even further specifications, such as reviewing findings regarding land use conflicts in European agriculture (28 publications), could be possible.

In terms of research aims, authors have most frequently analyzed tools, methods, and strategies to manage, reduce, or solve conflicts (110 publications). The number of different tools that were tested is almost as large and ranges from using Q-methodology to reframe problems (Asah et al. 2012) to applying storytelling (Gallant, Ball, and Caldwell 2006), artificial neural networks (Montanari, Londei, and Staniscia 2014), or geo-simulation (Su et al. 2017) to manage land use conflicts. Identifying actual or potential land

use conflicts is also a popular aim (91 publications). Here, the works of Valle Junior et al. (2014, 2015) on the identification of conflicts between land capability and actual land uses have received much attention, followed by Darly and Torre's study on conflicts over farmland uses (2013). Analyzing the causes and drivers of conflicts is the third-most common research aim (64 publications), with all other aims having received significantly less attention. In view of the high numbers of these three categories, the synthesis of findings regarding each of these research interests would be another useful next step for the research field.

Knowledge Gaps

Despite the wide range of aspects that have been addressed, some knowledge gaps could be identified. Thirty-two countries were covered by only one publication, and many others were never covered. In particular, countries in Northern Africa, the Middle East, and Central Asia have mostly been ignored by the international land use conflict literature (Figure 1), and as continents, South/Central America and Africa seem particularly underrepresented (Figure B.13). These gaps might be about to narrow somewhat, as South/Central America, Asia, and Africa were the continents that saw the sharpest increase in research in recent years. Nevertheless, more primary research in countries and regions that have not or seldom been included is necessary to ensure coverage of all relevant aspects of land use conflicts and a balanced body of knowledge. Moreover, comparisons across countries and continents could add new insights regarding the distribution of conflicts, their causes, and different ways of handling them. To date, six publications have conducted a global analysis (most recently, Hassan et al. 2015; Ferrarini et al. 2017). An additional 10 papers have regarded more than one continent (i.e., Marr, Howley, and Burns 2016; Dannenberg, Revilla Diez, and Schiller 2018), and 17 publications involve several countries on the same continent (i.e., Sinthumule 2016; Sebastien, Pelenc, and Milanesi 2019). The vast majority of studies, however, are local and cover a subnational region.

Land use issues such as water management, indigenous land, hunting/fishing, and nonrenewable energy infrastructures have played a minor role in the mapped literature (Figure B.8). Analyzing the land use issues by continent revealed even more gaps, for example, regarding recreation/tourism conflicts in Africa, Asia, and South/Central America, indigenous land in Europe and Australia/Pacific, or water management in Australia/Pacific and North America (Figure B.9). Of course, the relevance of land use issues varies between regions, and the coverage in the literature might reflect this. Some land use issues might also be framed differently depending on the region. For example, there are several studies about conflicts involving Sami reindeer herding in Northern Europe; however, they are framed in the context of pastoralism, not as indigenous land (Pape and Löffler 2012; Widmark and Sandstrom 2012; Horstkotte, Lind, and Moen 2016). Nevertheless, another good starting point for future primary research could be to take a closer look at currently underrepresented land use issues. This can enhance our knowledge regarding issues that are thus far poorly understood and might even reveal new conflicts that have gone unnoticed by the international scientific community.

Regarding research aims, two aims were so rare that they were combined in the "other" category in Figure B.10: three studies proposed a research agenda involving land

use conflicts (Martin, Scherr, and City 2010; Pape and Löffler 2012; Seppelt, Lautenbach, and Volk 2013), and only one study tested the usefulness of conflict analyses in planning processes (Cilliers 2019). The latter seems particularly striking, as planning and conflicts are often described as inherently connected (Peltonen and Sairinen 2010). More work that investigates how to integrate research results in planning processes would thus be in order. Several other aims have also only been addressed by a few publications, among them to develop or test methods for the identification of land use conflicts (16 publications, most prominently Brown and Raymond 2014 on participatory mapping), to identify conflict properties, issues, or stakeholders (12 publications, among them Darly and Torre 2013 on conflicts over farmland uses in the Greater Paris Region and Steinhäußer et al. 2015 on national and regional land use conflicts in Germany), or to analyze and explain conflict dynamics (six publications, most prominently Yusran et al. (2017) on the empirical visibility of land use conflicts in Indonesia). As these topics are undoubtedly of high relevance, more primary research directed toward these aims is needed to complete our knowledge base.

Finally, a closer look at the subject areas that have contributed to the research field reveals another gap. Psychology should be expected to hold relevant knowledge concerning conflicts, yet surprisingly few publications have a psychological background (Figure B.3, but see Elix and Lambert 2007 on values mapping, Nash, Lewis, and Griffin 2010, and Anderson, Williams, and Ford 2013 on place meanings, Mannarini, Roccato, and Russo 2015 on the false consensus effect). Thus, more analyses that apply psychological insights to the study of land use conflicts might add new impulses, especially for conflict management, and could thus help to advance the field.

Conceptual Approaches

The first step to determine the conceptual approaches was the analysis of definitions. Seventy-three of the mapped publications provide an explicit definition of "land use conflict" (Figure B.14). The share of publications with a definition has increased somewhat over the study period, from <20% in most years before 2012 to between 20 and 40% in the years thereafter (Figure B.15). All definitions are cited in the systematic map, provided in the data publication (Fienitz 2022). When providing a definition, authors most frequently refer to von der Dunk et al. (2011, 149), according to whom "[…] a land-use conflict occurs whenever land-use stakeholders (=conflict parties) have incompatible interests related to certain land-use units (=geographical component)." Altogether, 19 definitions cite this. Ten further sources are cited less frequently but repeatedly and in total, 64 different sources are cited in the analyzed definitions (Supplementary Appendix C). Thus, while von der Dunk et al.'s definition is a popular reference, it is far from dominating.

However, not only are the sources to which the definitions refer diverse, but the definitions differ considerably in their conceptual understanding. Comparing the definitions in the mapped publications as well as how the term "land use conflict" was used throughout the mapped literature confirmed that researchers have approached the study of land use conflicts from various vantage points, focusing on different aspects of these conflicts. Four conceptual approaches were detected: a social approach, a spatial

approach, a normative approach, and a political approach. The remaining chapter presents these conceptual approaches in more detail.

Social Approach

Social approaches to studying land use conflicts were the most common and were detected in 181 publications (see the share of each approach in Figure B.16). Studies with a social approach focus on actors who have or perceive incompatible goals regarding the use of land; the social conflict between actors is the object of study. Sebastien's (2017) analysis of a conflict between local residents and a company that planned a landfill project and Walwa's (2020) study of conflicts between farmers and pastoralists are typical examples. Von der Dunk et al.'s frequently cited definition also applies a social approach. Another example is the definition of Brown et al. (2017, 1458), who adds: "The key elements of conflict are stakeholders (individuals or groups with incompatible interests), a geographic location, and the perceived consequences, often negative, of alternative land uses." Likewise, Cieslak states: "[…] the conflict in itself is a social concept. Humans are the subject of conflict, and conflict cannot arise without human participation" (2019, 2).

Spatial Approach

In contrast, 94 publications applied a spatial approach to study land use conflicts, the second-most frequent conceptual approach. These publications focus on the incompatibility of land uses, in the forms of competition between land uses or mutually obstructive land uses. Thus, the object of study is the spatial conflict between land uses. For instance, Saha and Pal (2019) studied wetland loss due to agricultural expansion in Bangladesh. An example of mutually obstructive land uses is provided in Eastgate and Morrison's article on military installations that negatively impact neighboring residential land uses because they emit noise and dust (2009). Sinthumule (2016) provides the following definition: "[…] a conflict exists whenever incompatible land use activities occur in the same area" (108). Similarly, Rahman (2017) writes, "[…] conflicting land use[s] are those land uses that are in conflict with the existing land use" (1329). Additionally, three publications studied human–wildlife conflicts when actual or desired human land uses were incompatible with the presence of wildlife. These publications were assigned to a subcategory of the spatial approach because one of the incompatible land uses is not by humans but by animals.

Normative Approach

The third was the normative approach, which was applied by 23 publications. Studies with a normative approach focus on situations when the actual land use differs from a normatively desirable use. The object of study is the discrepancy between the actual and the desirable, often more environmentally sustainable land use; reality and norms are incompatible. For example, Guidolini et al. (2020) identified areas where the actual land use did not match the land's capability, leading to environmental degradation risks. Studies with a normative approach often extend the term "land use conflict" and refer to "environmental land use conflict." The definition provided by Fernandes et al. (2019,

2) summarizes the normative approach: "When actual land uses differ from land capability, an environmental land use conflict develops."

Political Approach

Finally, 14 publications use a political approach; they focus on competing political or planning goals, competing laws, or competing norms regarding land uses. Here, the conflict that is studied lies between various land use objectives; objectives are incompatible. For example, Wolff et al. (2020) studied integrated landscape management as a method to reconcile multiple conflicting land use demands, such as food production, biodiversity conservation, and climate change mitigation, in Ghana. Similarly, Walker and de Alarcón (2018, 1) write about "conflict between the rights to adequate housing, environmental protection, and private property."

Mapping the Approaches

The four approaches differ in their distribution across the other attributes that were mapped in this study. Each approach started with low numbers of publications (below five publications per year) in the 2000s. From 2010 onward, publications with a social approach spurred, those with a spatial approach also increased in numbers, but the normative and political approaches only showed a moderate increase in research interest (Figure B.17). The terminology that is used also differs between the approaches. While "land use conflict" was the most common term in all approaches, the term "land use competition" played an important role in publications with a spatial approach. "Land use dispute," "land use controversy," and "land use struggle" only appeared in the titles, keywords, and index terms of those publications with a social approach. Thus, to some degree, the approaches have their own terminology (Figure B.18).

Regarding the applied methods, qualitative and mixed methods are predominantly used to study the social aspects of land use conflicts. Modeling is mostly applied in studies with a spatial approach, although it is also the dominant method in studies with a normative approach. Quantitative methods are almost equally used to study social and spatial aspects of conflicts (Figure B.19). Undoubtedly, some methods are more appropriate for the study of certain aspects of conflicts than others. Nevertheless, these findings add to the list of knowledge gaps above: Studies regarding the social aspects of land use conflicts could benefit from more quantitative work, while the spatial aspects of conflicts could be studied more frequently through qualitative or mixed methods.

The four approaches further display differing geographical foci and varying popularity depending on the subject area. The social approach dominates on all continents except South/Central America, where the normative approach is equally common. Spatial aspects are studied almost as frequently in Asia and South/Central America (Figure B.20). Unsurprisingly, publications from the Social Sciences most frequently apply a social approach. Studies focusing on spatial aspects of conflicts most often stem from the Environmental Sciences, and spatial aspects are the most-studied aspect in publications from the subject area "Energy" (Figure B.21).

Differences also emerged with regard to the land use issues that are studied. Studies on the social aspects of land use conflicts have mostly regarded conflicts about

agriculture, conservation/protected areas, settlement/urban issues, and forestry. Studies focusing on spatial aspects mostly addressed agriculture, renewable energy, and conservation/protected areas. Studies with a normative approach have particularly addressed agriculture and forestry, and most of those with a political approach addressed conservation/protected areas (Figure B.22). Again, these results add to the list of knowledge clusters and gaps. In particular, the spatial aspects of land use conflicts around renewable energy seem to have been addressed extensively, but the social aspects of these conflicts are thus far understudied.

Discussion

These results show that land use conflict research is indeed an extensive and complex research field. On the one hand, complexity stems from the high number of existing publications, the rapid growth in recent years, and the diversity of topics that have been addressed. Systematic mapping—applied here to the field of land use conflict research for the first time—has proven a useful tool in this context because its comprehensive approach allowed an overview of a larger and more diverse set of publications than the more targeted systematic review approach. It thus contributes to evidence-based formulation of a research agenda for land use conflict research (James, Randall, and Haddaway 2016) that is much broader compared to the highly specific suggestions made by those authors who have previously proposed research agendas (Martin, Scherr, and City 2010 argued for "research that places lawyers at the center of analyses" (175), Pape and Löffler 2012 for better integrated research on conflicts in reindeer husbandry, Seppelt, Lautenbach, and Volk 2013 for research that analyzes conflicts across spatial scales). Another central output of the systematic mapping is the searchable database (Fienitz 2022) that allows to quickly identify publications with selected attributes or even combinations of attributes (Haddaway and Pullin 2014). With its generalist approach, this paper thus lays the groundwork for future reviews of the identified subfields, which can then generate more detailed analyses. Notably, Seppelt, Lautenbach, and Volk (2013) have already addressed the cluster on tools, methods, and strategies to manage, reduce, or solve conflicts with their review of methods to optimize land management. Pape and Löffler (2012) and Wolf, Baldwin, and Barry (2017) addressed the smaller cluster on pastoralism/grazing with reviews of land use conflicts in reindeer husbandry and livestock grazing on public lands. Ferrarini et al. (2017) reviewed one aspect within the renewable energy cluster, conflicts around bioenergy buffers, and De Jong et al. (2021) addressed the cluster on causes of land use conflicts by reviewing causes of conflicts related to land use change.

Moreover, mapping revealed that the research field's topics have been addressed unequally. Many topics have rarely been addressed and are thus considered research gaps. Some of these gaps have previously been identified by individual researchers, such as Yasmi, Schanz, and Salim (2006), who called for more research on the escalation dynamics of conflicts in natural resource management. Overall, however, there seems to be limited awareness of the identified gaps—an issue this paper intends to change. Importantly, the gaps must not be interpreted as indicating low numbers or low relevance of conflicts in these topics or regions. Other factors more likely explain the

distribution of studies, such as the interests of researchers, the amount of available funding for land use conflict research in each region or subject area, cultural differences in dealing with conflicts, or even the locally preferred language for publication of results. Indeed, some of the gaps identified here are in sharp contrast with media and civil society reports of severe land use conflicts, for example in many regions in South/Central America or Africa (i.e. Bob 2010; Arellano and Praeli 2022).

On the other hand, the research field's complexity stems from the fuzziness of the term "land use conflict." This has been observed before (i.e., Sinthumule 2016; Ma et al. 2020), but the challenges that emerged in conducting this mapping further underline this issue. First, the term is fuzzy because many related but not synonymous terms exist. These related terms are narrower, such as "forest conflict" (i.e., Saarikoski, Mustajoki, and Marttunen 2013) or "farmer-herder conflict" (i.e., Walwa 2020), or wider, such as "resource conflict" (i.e., Côté 2021). Some terms overlap partially: "policy conflict" is used for conflicts about the construction of roads (see Wolf and Van Dooren 2021) or energy infrastructure (see You et al. 2023), which can also be considered land use conflicts. However, it also includes conflicts that are unrelated to land use, such as conflicts on gender violence policy (see Cabezas 2022), and not all land use conflicts raise policy issues. This terminological diversity makes a complete overview of research on land use-related conflicts almost impossible (see also Kovács et al. 2015), which is why this paper focused on mapping those publications that use the actual term "land use conflict" (or a synonym of "conflict"). Thus, the identified gaps have to be regarded with some caution, as they may have been covered in related literature threads that were not mapped here. Further mapping efforts that collect the studies conducted under the related terms are therefore needed, as well as works that continue to define and delimit these related terms. More awareness of the different existing terms is also advisable. For example, the use of overlapping terms in keywords could enhance the traceability of works on the same kinds of issues across different literature threads. This might help to break up the "silos" of conflict research lamented by Harrison and Loring (2020).

Secondly, "land use conflict" is a fuzzy term because it encompasses several conceptual approaches, as this mapping has shown. This has caused some confusion in the literature, where a debate ensued as to whether land use conflicts are primarily spatial or social (i.e., Boyd et al. 2013). This mapping offers the conciliatory finding that no side is wrong: Land use conflicts are complex, multidimensional phenomena comprising spatial, social, normative, and political aspects, all of which are legitimate objects of study. Thus, a general definition of "land use conflict" that accommodates all conceptual approaches could be: *Land use conflicts are conflicts about how land should be used, that encompass spatial issues (incompatible land uses), social issues (incompatible land use preferences of actors), normative issues (incompatibilities between actual and normatively desirable land use), and political issues (incompatible land use objectives).* In research practice, however, definitions that are targeted to the conceptual approach(es) that a given study applies might be more meaningful and help to clearly delimit the object of study. This will be particularly important for the synthesis of results across studies.

It remains to remark that the different aspects of land use conflicts that were demarcated here are nevertheless highly interconnected (see also Debolini et al. 2015; Liu et al. 2015). With that in mind, it makes sense that several publications applied more

than one conceptual approach. Doing so more often and more deliberately might prove beneficial for the research field (see also Kling, Dahlberg, and Wall-Reinius 2019) and would allow us to better understand how spatial, social, normative, and political aspects interact in land use conflicts.

Limitations

As explained above, the high number of related terms to "land use conflict" has caused some challenges, and all results presented here only apply to that part of the literature that uses the actual term "land use conflict," or a synonym. Additionally, the coding of text necessarily involves some interpretation. To avoid inconsistencies in the coding process, much attention was given to clearly defining each category and to eliminating any ambiguities. In case of doubt, the "unclear" category was chosen to ensure that publications would not be classified incorrectly. Furthermore, a sample of the publications was re-coded after some months to test if the results were consistent.

Implications for Policy, Practice, and Future Research

Creating an evidence-based research agenda for land use conflict research has been one of the main aims of this paper, and several starting points for future research have been identified throughout it. Table B.23 (Supplementary Appendix B) summarizes these takeaways for future research. In addition, the results of this systematic mapping also hold relevant information for policy and practice. The identified knowledge clusters point out those topics where abundant knowledge is available to assist policy-makers and practice actors. Moreover, the searchable database (Fienitz 2022) can be a useful tool to identify and find relevant studies.

Conclusions

The objective of this paper was to provide an overview of the current state of land use conflict research, with a special focus on conceptual approaches. Systematic mapping has revealed an extensive research field with several subfields that are well-covered, but it also identified some knowledge gaps. It thus contributes to an evidence-based formulation of a research agenda, identifying those topics that need a synthesis of findings and those that need more primary research (see Table B.23). Moreover, the interpretive analysis of how the term "land use conflict" is used revealed four different conceptual approaches to the study of land use conflicts. By describing and demarcating them, this paper can help to bring some more clarity into the fuzzy "land use conflict" concept. Filling the gaps identified here, land use conflict research will be well-equipped to meaningfully contribute to the quest for sustainable development in the face of scarce land resources.

Note

1. In this paper, "land use" is understood as "the purposes and activities through which people interact with land and terrestrial ecosystems" (Meyfroidt et al. 2018).

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