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Adaptation and Peace: Extending the Agenda for Capacity-Building in Climate and Conflict-Affected Communities

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ABSTRACT

Climate change impacts on the social–ecological conditions that communities depend on may increase the vulnerabilities to new conflicts. Yet, the communities that will be most impacted by climate change, as noted by the Intergovernmental Panel on Climate Change (IPCC), are already conflict-affected communities. Here, we present the results of a systematic review of quantitative and qualitative studies ($n = 212$) in Spanish and English on the climate–conflict relationship. We found that most studies are focused on a direct relationship between climate change and violent conflict, and there has been less attention on a contextual or indirect relationship in already conflict-affected communities. Studies on this contextual or indirect relationship suggest a climate change–conflict cycle that is negatively reinforcing, whereby violent conflict increases climate change vulnerability and feedback from climate change increases violent conflict vulnerability. While limited in number, such studies provide important insights enabling further conceptual development and empirical examination of how climate impacts interact with violent conflict, and how governance efforts can simultaneously support peacebuilding and climate change adaptation. Drawing this work together with the latest frameworks in conflict studies and adaptation, we sketch out a promising synthetic agenda, focusing on how to design policies and projects that build synergistic capacities and address cumulative and interactive impacts of climate change and violent conflict. Without such insight, efforts to treat climate and conflict in parallel may be ineffective or even counterproductive, worsening violent conflict and, in turn, further reducing the capacities of communities to build peace and resilience.

RESUMEN

Los efectos del cambio climático en las condiciones socio ecológicas de las que dependen las comunidades puede aumentar la vulnerabilidad a nuevos conflictos. Sin embargo, las comunidades que se verán más afectadas por el cambio climático, como señala el Grupo Intergubernamental de Expertos sobre el Cambio Climático (IPCC), son las que ya sufren conflictos. Aquí presentamos los resultados de una revisión sistemática de estudios cuantitativos y cualitativos ($n = 212$) en español e inglés sobre la relación clima-conflicto. Encontramos que la mayoría de los estudios se centran en una relación directa entre cambio climático y conflicto violento, y se ha prestado menos atención a una relación contextual o indirecta en comunidades que ya sufren conflictos. Los estudios sobre esta relación contextual o indirecta sugieren un ciclo cambio climático-conflicto que se refuerza negativamente, por el cual el conflicto violento aumenta la vulnerabilidad al cambio climático y la retroalimentación del cambio climático aumenta la vulnerabilidad al conflicto violento. Aunque su número es limitado, estos estudios aportan ideas importantes que permiten profundizar en el desarrollo conceptual y el examen empírico de cómo interactúan los efectos del clima con los conflictos violentos, y cómo los esfuerzos de gobernanza pueden apoyar simultáneamente la consolidación de la paz y la adaptación al cambio climático. A partir de este trabajo y de los marcos más recientes en estudios sobre conflictos y adaptación, esbozamos una prometedora agenda sintética, centrada en cómo diseñar políticas y proyectos que creen capacidades sinérgicas y aborden los impactos acumulativos e interactivos del cambio climático y los conflictos. Sin esta perspectiva, los esfuerzos para tratar el clima y los conflictos violentos de forma paralela pueden resultar ineficaces o incluso contraproducentes, empeorando los conflictos violentos y, a su vez, reduciendo aún más las capacidades de las comunidades para construir paz y resiliencia.

1 | Introduction

Climate-induced changes will have significant negative effects on human behaviors (Intergovernmental Panel on Climate Change 2018; 2022) (IPCC). These effects may lead to new resource competition and conflict or put additional strain on already conflict-affected communities (Lhoest et al. 2022; Miles-Novelo and Anderson 2019; Walby 2013). Since these climate-induced security implications were highlighted in the IPCC's 4th assessment report in 2007 and the first special session of the United Nations (UN) Security Council in the same year, scholars have dedicated much attention to establishing the causal links between climate impacts and future and/or past conflict (Bakhsh et al. 2020; Chavunduka and Bromley 2011; Jones, Mattiacci, and Braumoeller 2017; Koubi et al. 2012; Landis 2014; Raleigh and Urdal 2007; Theisen 2008; von Uexkull, Loy, and d'Errico 2023). This scholarly focus was built on broader efforts to emphasize stability, human security, and humanitarian concerns that had, until then, primarily been the focus of practitioners and the grey literature (Renner, Chafe, and Mastny 2007; Smith and Vivekananda 2007; Stedman 2007). Despite its growing importance, there is a limited understanding of climate change impacts in communities that are already experiencing violent conflict or engaging in peacebuilding processes, and how these cumulative impacts might affect efforts to build adaptive capacities to address climate change (e.g., climate adaptation projects) in the face of violent conflict.

To broaden our understanding of the impacts of climate change in conflict-affected communities we conducted a review of the limited but growing number of studies focused on how climate change impacts interact with existing and/or past violent conflict. To counteract the dominance of English-speaking narratives, we conducted our review in Spanish and English. Importantly, we did not limit the systematic review to literature attempting to find a direct relationship between climate change and violent conflict, as this is already a well-established area of study (Buhaug 2010; Busby et al. 2018; Hendrix et al. 2022; Ide 2023; Mach et al. 2019; Raleigh and Urdal 2007; Salehyan and Hendrix 2014; Slettebak 2012; Theisen 2008; von Uexkull, d'Errico, and Jackson 2020). Rather, we moved beyond the direct relationship to identify and synthesize studies that are beginning to build a comprehensive understanding of the interactions between the impacts of climate change and conflict in already conflict-affected communities.

Specifically, in our review, we asked: (a) Under what circumstances or intervening factors does the literature suggest climate change interacts with violent conflict? (b) How does climate change adaptation occur in conflict-affected communities? and (c) What new understanding is needed to bridge the gap between peacebuilding and climate adaptation efforts? To answer these questions, we first introduce the parameters of our systematic review method. We then briefly introduce the state of play in understanding climate change impacts and conflict before interrogating the implications for future research and practice. Through our literature review, we lay the groundwork for policymakers and future researchers to understand and improve the interactions between climate change adaptation and peace in already conflict-affected communities.

2 | Methods

To review the literature on climate change impacts and violent conflict in conflict-affected communities, we conducted a systematic literature review from 2007 to 2023, including a comprehensive citation search of all references cited in the papers initially identified. Systematic reviews comprise an exhaustive and comprehensive search of the literature and synthesis of the existing knowledge on a specific topic with a high degree of precision, clarity, and replicability (Biesbroek et al. 2018). A systematic review includes a set of review questions, inclusion/exclusion criteria, a replicable method, a systematic search to identify papers that would meet the criteria, and a synthesis of the characteristics and findings of the included studies (Lasserson, Thomas, and Higgins 2019). We restricted our review to the papers using the definitions, concepts, and

procedures described below in Section 2.1 in both Spanish and English. Spanish is one of the most spoken languages in the world after English and is the official language of more than 20 countries and territories, many of which have experienced both severe climate impacts and violent conflict (Programa de las Naciones Unidas para el Desarrollo (PNUD) 2023). The dominance of English as the common language of climate social science presents a major challenge for increasing the contribution of studies of Spanish-speaking countries and Spanish-speaking authors (Amano et al. 2023; Nolde-Lopez et al. 2023). The included papers in Spanish and English were organized as indicated by the Preferred Reporting Items for Systematic Reviews and Meta-Aanalyses (PRISMA) methodology (Page et al. 2021).

2.1 | Definitions of Climate Change and Violent Conflict

The IPCC defines *climate change* as long-term alterations in temperatures and weather patterns (IPCC 2018). Climate change is not synonymous with *climate variability*, which is defined as the way that climate variables (such as precipitation and temperature) differ from an average (IPCC 2018). Climate change includes significant changes in decades or longer, rather than changes in weather patterns that occur in a month or year. Similarly, climate change is not synonymous with *climate extremes*, which are defined as occurrences of rare climate conditions that can cause devastating impacts on communities (Herring 2020).

For this review, we were interested in all the potentially important variables of a changing climate that may influence human behavior, including climate change, climate variability, and climate extremes. Thus, we broadened our review to all climate-related social–ecological system (SES) changes (see Table 1). A SES reflects an interconnected relationship between individuals and/or social groups and ecosystems (Folke 2006; Ostrom 2009). SESs experience constant changes triggered by ecological, economic, institutional, and social factors that impact communities and ecosystems (Moore et al. 2014). Climate-related social–ecological changes, therefore, refer to climate-induced changes in ecological conditions that impact communities and ecosystems. This understanding formed a useful definition of climate change as we worked through the literature.

Definitions of conflict, by contrast, encompass notions of conflict intensity, level of social organization, and different actors and drivers. Studies analyzing conflict and climate change commonly differentiate between "civil war (> 1000 battle-related deaths or casualties) and civil conflict (> 25 battle-related deaths or casualties)" (Koubi 2019). However, as intensity is not consistently used in studies to define conflict, we used the concept of violent conflict to capture both high and low-intensity conflicts. Conflict can be violent (i.e., involves the use of physical or psychological force to act against individuals and/or groups; Galtung 1969), armed (i.e., between organized armed groups such as insurgents and state forces; Mach et al. 2019), and/or communal (i.e., between groups that are united "along some communal identity," such as pastoralists and farmers in Africa [McNeely 2011; van Baalen and Mobjörk 2016a, 2016b]). Here, our interest was in all forms of violent conflict (see Table 1), including (but not limited to) armed conflict to cover qualitative studies that (commonly) do not use a level of intensity to define conflict. Violent conflict is defined here as a confrontation in which two or more individuals or groups consider their values, interests, or needs as opposite and assume violent actions to impose them (Ide et al. 2016). This excludes other forms of conflict that may be impacted by climate change such as social conflict (e.g., protests, riots, or livestock theft), targeted assassination of environmental leaders often engaged in climate-related protest (e.g., anti-hydro infrastructure), and/or gang violence in urban contexts. In excluding these types of conflict, we acknowledge our work must not be considered exhaustive. Definitions of conflict-affected areas, ultimately, include areas identified by the presence of conflict; the transition from conflict to peace; severe human rights violations; political and social unrest; and/or institutional instability (Hellin et al. 2018; Sitati et al. 2021; United Nations Development Programme (UNDP) 2021; Vivekananda, Schilling, and Smith 2014a).

TABLE 1 | Definitions used in the review.

Term	Definition	Variables included in the review
Climate-related SES changes	Changes in ecological conditions that are affected by climate variations that impact communities and ecosystems.	Climate Climate change Climate variability Climate extreme
Violent conflict	Confrontation in which two or more individuals or groups consider their values, interests, or needs as opposite and assume violent actions to impose them	Violent conflict Armed conflict Conflict-affected

2.2 | Conducting the Search

Systematic keyword searches were conducted using two databases: Scopus and Web of Science (WoS). For the search, we used a Boolean search string of keywords about climate-related SES changes that may influence human behavior and violent conflict (detailed in Table 2). The initial search generated 694 papers in Scopus and 72,349 in WoS, of which 56 were duplicates. We then removed 148 in Scopus and 46,145 in WoS before screening based on the inclusion/exclusion of the search string in the title, abstract, and/or keywords. As a result, we screened 26,694 papers and removed a further 26,050 that were not directly relevant to the review. For example, papers focused on animal–human conflicts, conflict of interest, gang violence in urban contexts, protests, or riots, or papers that only briefly mentioned climate-related SES changes without additional analysis were removed.

After removing the papers considering the relevance of the study, we attempted to retrieve 644 papers, but 138 were not retrievable from the databases because of access restrictions and regional limitations imposed by publishers. As a result, 506 papers were assessed and included/excluded based on the selection criteria (see Table 3). We excluded studies published before 2007, a year that marked a significant starting point in the climate change–conflict literature. The year 2007 was selected in the inclusion/exclusion criteria to reflect the increase in the literature related to the topic after the session of the UN Security Council on climate security and the release of the IPCC 4th assessment report (Scheffran, Kominek, et al. 2012; Scheffran, Brzoska, et al. 2012; Weir and Virani 2011). The review was not limited to studies focused on a specific geographical region but to the reference type and language. For instance, the studies included in the review were books, journal articles, reports, and/or book sections in both Spanish and English. We subsequently excluded studies that were not about a direct relationship between climate change and violent conflict and/or a contextual or indirect relationship between climate change and existing or past violent conflicts. Ultimately, we excluded studies because they focused on non-violent conflicts or environmental hazards not related to climate change.

After applying the selection criteria laid out in Table 3, we identified 152 papers for the analysis. To secure a comprehensive search we subsequently searched for grey literature and other peer-reviewed papers in the reference lists of the papers found in Scopus and WoS, and the papers cited by these papers (i.e., a citation search). This yielded 60 additional studies and a total of 212 studies to review (see Figure 1, PRISMA flow diagram). A complete summary of the studies included in the review organized by the attributes: year, title, author, reference type (journal article, book, report, or book section), study type (peer-reviewed or grey literature), language (Spanish or English), location, subregion, region, method (e.g., quantitative, qualitative, or mixed methods) document type (e.g., empirical, review or conceptual) and analysis type (direct or contextual/indirect) can be found in the Appendix S1 to this paper. Location and subregional groupings of studies are based on the United Nations UN geoscheme Standard M49: Northern Africa, Eastern Africa, Sub-Saharan Africa, Middle Africa, Southern Africa, Western Africa, Caribbean, Central America, South America, Northern America, Central Asia, Eastern Asia, South-Eastern Asia, Southern Asia, Western Asia, Eastern Europe, Northern Europe, Southern Europe, Western Europe, Australia and New Zealand, Melanesia, Micronesia, and Polynesia (United Nations Statistics Division 1999). Regional groupings are based on the same United Nations UN geoscheme Standard M49: Africa, Asia, Europe, Americas, Oceania, and Antarctica (United Nations Statistics Division 1999).

To code the 212 studies we conducted a thematic analysis (Braun and Clarke 2006) in the Qualitative Data Analysis Software (QSR) NVivo 20. In finding repeated patterns of meaning or themes from the studies we used an inductive method to determine what are the interactions between climate change impacts and violent conflict. However, our findings should not be considered exhaustive. While we believe that the focus on literature published in Spanish represents an important advance over much of the existing work in this space, which focuses almost exclusively on literature published in English, we do acknowledge that not being able to consider literature published in additional languages beyond Spanish and English remains a limitation of our work.

Once completed the coding process, we summarized and identified dominant patterns in the literature. We also used Excel to map the location of the empirical studies and determine what are the case study gaps in our understanding of the relationship between climate change and violent conflict. An

TABLE 2 | Keywords used in the search.

Strings and combinations
climate OR “climate change” OR “climate variability” OR “climate extreme” AND “violent conflict” OR “armed conflict” OR “conflict-affected”

TABLE 3 | Selection criteria.

Reason	Inclusion	Exclusion
1. Date of publication	Studies are published on a time scale of 2007–2023.	Studies are published before 2007.
2. Reference type	Studies are books, journal articles, reports, or book sections.	Studies are conference papers, editorial letters, notes, and/or commentaries.
3. Language	Studies are in English and/or Spanish to contribute to a solid and inclusive scientific base.	Studies are not in English and/or Spanish.
4. Response to the review questions	Studies focus on a direct relationship between climate change and violent conflict and/or a contextual or indirect relationship between climate change and existing or past violent conflicts.	Studies do not focus on a direct relationship between climate change and violent conflict and/or a contextual or indirect relationship between climate change and existing or past violent conflicts.
5. Relevance to the review	Studies focus on violent conflicts and environmental impacts related to climate change.	Studies focus on non-violent conflicts and environmental hazards not related to climate change.

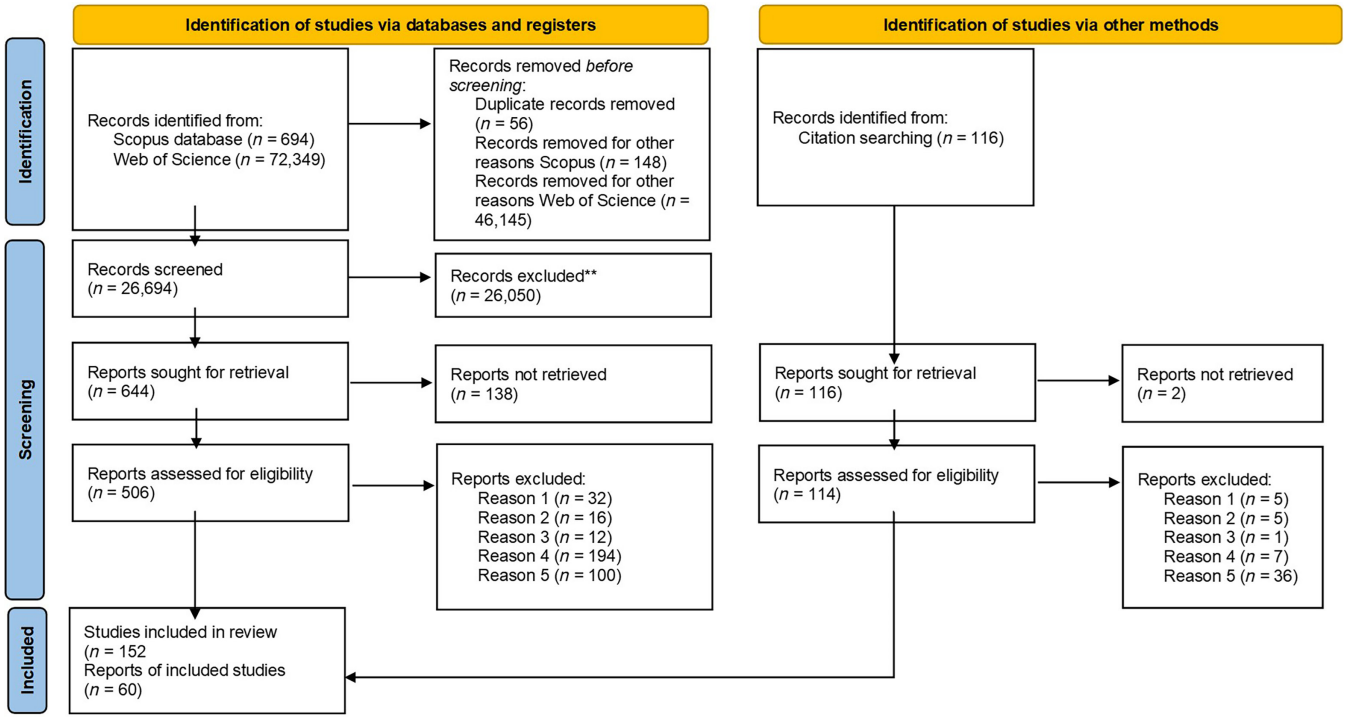

FIGURE 1 | PRISMA flow diagram about the identification of studies via databases and other methods. PRISMA flow diagram derived from Page et al. (2021).

important point to note is that some of the reviewed studies may focus on direct relationships or pathways while others on the contextual or indirect relationships between multiple climate-induced changes and types of conflict. In that case, the type of analysis (i.e., direct and contextual/indirect) has been coded separately. For instance, when a reviewed study is focused on understanding how climate change leads in a direct way to violent conflict, we coded the study as "direct" and reflected it in the bar diagram (Figure 2b) presented in the following section.

3 | Climate Change and Violent Conflict: A Brief Overview

Overall, we confirmed that existing knowledge of climate change impacts and violent conflict has construed two types of analyses. The first focuses on whether and how climate change impacts cause in a direct way violent conflict (direct analysis), and the second focuses on contextual and indirect ways in which climate change can influence conflict (contextual/indirect analysis). Cutting across these two types of analyses we found several recurrent key concepts that focused on climate change adaptation, peacebuilding, and adaptive capacity. We discuss and interpret these findings in greater detail in the following sections.

3.1 | Climate Change as a Direct Cause of Violent Conflict (Direct Analysis)

The climate change literature has long-analyzed direct relationships between climatic variables (temperature, precipitation, and water availability) and conflict variables (number of conflicts or casualties) (Abdi, Mohamed, and Sugow 2023; Breckner and Sunde 2019; Castro Vargas 2021; Helman and Zaitchik 2020; Landis 2014; Lee et al. 2019; Price and Elu 2017; Schilling et al. 2014; Tol and Wagner 2010; Witmer et al. 2017). Isolating the causal impact of climate change on violent behaviors has proven difficult, however, and studies on climate change and conflict argue that there is not a direct causal relationship (Bukari, Sow, and Scheffran 2018; Busby et al. 2018; Fatima et al. 2022; Hegre et al. 2016; Koubi et al. 2012; Malamud 2020; Rowhani et al. 2011; Selby and Hoffmann 2014). Instead, conflict is caused by a number of indirect or intermediate variables including (but not limited to) local land use (e.g., agricultural or crop production, resource scarcity or abundance, and food production [Benjaminsen et al. 2012; Buhaug et al. 2015; Exenberger and Pondorfer 2014; Schon, Koehnlein, and Koren 2023; Theisen 2008; Wischnath and Buhaug 2014]), communities' vulnerability (e.g., access to water or food, market and price shocks, migration or livelihood pressures [Brown et al. 2013; Marcantonio, Attari, and Evans 2018; Okpara, Stringer, and Dougill 2017; Raleigh, Choi, and Kniveton 2015; Sultana and Thompson 2017]) and, the state response (e.g., relief aid, or subsidies [Egorova and Hendrix 2014; Ide 2023; Renner, Chafe, and Mastny 2007]).

In studying indirect or intermediate variables academics have associated the 2011 social and political unrest in Syria, and the civil war, with the intense drought that impacted the region between 2007 and 2009 using intermediate variables (Abel et al. 2019; Daoudy 2021; Eklund et al. 2022). The indirect or intermediate variables were "unemployment and poverty levels, corruption, repression and police brutality, injustice, a growing rural–urban divide, and a lack of political freedom" (Eklund

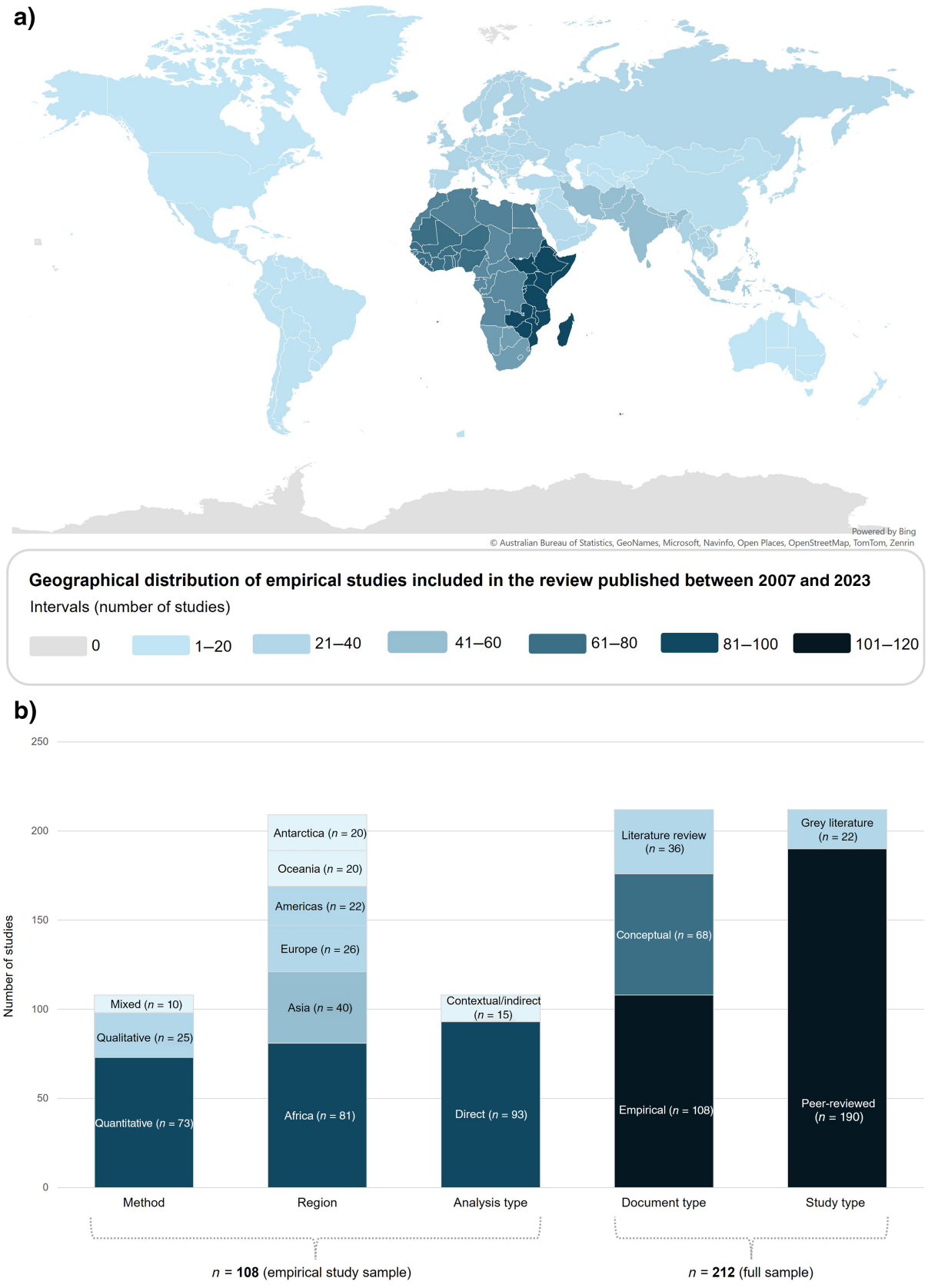

FIGURE 2 | Geographic distribution and attributes of climate change-conflict studies included in this review published from 2007 to 2023. (a) Geographic distribution of study locations of empirical studies ($n = 108$ [empirical study sample]). The interval distribution of the number of studies in the all-time series (2007–2023) is grey: 0 empirical studies, very light sky blue: 1–20 empirical studies, light sky blue: 21–40 empirical studies, sky blue: 41–60 empirical studies, navy blue: 61–80 studies, dark navy blue: 81–100 empirical studies and very dark blue: 101–120 empirical studies. (b) Attributes of the climate change-conflict studies included in this review are Method, Region, Analysis type ($n = 108$ [empirical study sample]), Document type, and Study type ($n = 212$ [full sample]).

et al. 2022). In analyzing indirect or intermediate variables in other studies we found that violent conflict is consistently considered to be structurally influenced by the socio-economic and political conditions of individuals and communities and is increasingly framed as a "threat multiplier" (Pacillo et al. 2022; Sofuoglu and Ay 2020) or "contributing factor" (Abdi, Mohamed, and Sugow 2023; Lee et al. 2013). These notions suggest that climate change does not cause conflict in a deterministic way, but can exacerbate the risks of a conflict occurring or worsen the impacts of existing conflicts (Buhaug 2016). For instance, in Sub-Saharan African and South American households, socioeconomic vulnerability and conflict interact with climate change. Conflict-affected households with low levels of socio-economic development often live in areas prone to climate stress, such as flooding. This interaction has led to increased vulnerability to climate change and the risk of relapse into violent conflict (Stein 2018; Swain, Öjendal, and Jägerskog 2021). Yet, empirical evidence on how these rapid-onset climate events (e.g., floods, heatwaves, storms) and slow-onset climate changes (e.g., sea-level rise, ocean acidification) may lead to violent conflict is inconclusive and there is no consensus on a general and robust climate–conflict direct causal relationship (Ayana et al. 2016; Cao et al. 2022; Exenberger and Pondorfer 2014; Ide et al. 2014; Linke et al. 2015; Vivekananda, Schilling, and Smith 2014b). This complexity arises, as some scholars have noted, because studies use different conflict variables (e.g., civil conflict, communal conflict, armed conflict), climate change measures (e.g., changes in precipitation and temperature, natural disasters), spatial scales (e.g., households, provinces, countries, or regions), and temporal scales (e.g., months, years, decades) and intermediate variables (e.g., economic growth, agricultural production, migration, land use) which makes it difficult to draw general conclusions about the relationship between climate change and conflict (Mach et al. 2019; Salehyan 2014).

3.2 | Climate Change Impacts in Already Conflict-Affected Communities (Contextual/ Indirect Analysis)

Climate change will be especially intense in already conflict-affected communities (Sitati et al. 2021; Vivekananda, Schilling, and Smith 2014a). This is because climate change can exacerbate the consequences of violent conflict which, in turn, can increase vulnerability to the impacts of climate change (Feola, Agudelo Vanegas, and Contesse Bamón 2015; Martinez and Vergara Tamayo 2016; Mason, Zeitoun, and El Sheikh 2011; Wischnath and Buhaug 2014). Conflict-affected communities often face rising violence and displacement and at the same time changing rainfall patterns and increased temperatures because of climate change (Crost et al. 2018; Delina et al. 2023; Hellin et al. 2018; Swain, Öjendal, and Jägerskog 2021). In Niger, Burkina Faso and Mali communities were displaced because of conflict in 2019, and in 2020 those communities were subsequently affected by floods (International Committee of the Red Cross 2020).

Conflict-affected communities also face significant difficulties during peace transition processes, including security, institutional capacity building, and achieving development (Brown et al. 2013; Rodriguez Garavito, Rodriguez Franco, and Duran Crane 2017). Added to those difficulties are the impacts of climate change, which may cause responses to conflict to be less effective (Okpara, Stringer, and Dougill 2017). The United Nations General Assembly has stressed that the most vulnerable communities, those conflict or post-conflict communities, will be greatly impacted by climate change, reinforcing the consequences of violent conflict (Nicoson 2017). For example, Liberia on the West African coast experienced a violent conflict from 1980 to 2003. In 2007 Liberia started the process of consolidating peace yet faced significant difficulties. Returning displaced communities settling in rural regions, intensified land disputes. Communities also faced climate change impacts, such as storm surges and floods, that threatened to destabilize the peace process (Smith and Vivekananda 2007).

In analyzing these empirical studies, we found that when interacting, climate change and existing conflicts may generate cumulative effects, in particular, they may deepen vulnerabilities to climate change and increase the probabilities of the onset of conflict. In Afghanistan, the interactions of conflict and droughts intensified the levels of conflict and insecurity preventing communities from accessing humanitarian aid and basic services (Prívara and Prívarová 2019). As mentioned before, while it may not be possible to directly link climate change to violent conflict in general, climate change impacts may disproportionally affect vulnerable regions that are already experiencing conflict or have experienced it in the past and conflict can make responses to climate change less effective or resourced (Gilmore et al. 2018), constituting a promising area of study.

Our results support previous conclusions (Adams et al. 2018; Buhaug 2016; Hendrix and Salehyan 2012; Sharifi, Simangan, and Kaneko 2021) that climate change and conflict studies tend to concentrate on certain areas and that several communities (e.g., South America and South-Eastern Asia) that have experienced various conflicts and/or are intensely vulnerable to climate change impacts are understudied. In the map (Figure 2) we observe that most empirical studies are in the East and South-East of Africa. The dominant study of these regions is usually justified by the high vulnerabilities in the Lake Chad Basin (Okpara, Stringer, and Dougill 2017, 2018; Sharifi et al. 2021), and the number of pastoral-herder and other conflicts in the Horn of Africa (Hoch et al. 2021; Solomon et al. 2018; van Weezel 2019). But other regions with significant vulnerabilities to climate change and prone to violent conflict (or already conflict-affected regions), such as South-Eastern Asia and South America, are understudied. This knowledge gap, sometimes referred to in the literature as the "streetlight effect" (Adams et al. 2018), may suggest that scholars tend to focus on areas for reasons of convenience. This can be problematic if case selection (and, therefore, knowledge production) is driven by convenience rather than practical relevance (Adams et al. 2018). Moreover, the dominance of studies in English (see Figure 3) suggests that if journals and studies in other languages (e.g., Spanish or Portuguese) were adequately captured in the databases we used for this review, there may have been a shift in the geographical focus of the literature on

climate change and violent conflict (Adams et al. 2018; Nolde-Lopez et al. 2023).

In Figure 2b we observe that quantitative methods (e.g., large-*N* studies) are also the primary methods in climate change and conflict studies and that the analysis tends to be dominated by direct correlations between climate change, and violent conflict (direct analysis). Only a handful of studies provide evidence on contextual and indirect ways in which climate change can influence conflict in conflict-affected areas (contextual/indirect analysis) (see Figure 3). These studies indicate that in conflict-affected areas social instability and conflict may reinforce the causal loop even if projects or actions focused on improving the resilience of the area are being implemented (Abrahams 2021; Delina et al. 2023; Hellin et al. 2018; Renner, Chafe, and Mastny 2007). As a result, communities in conflict-affected areas are highly vulnerable to climate change impacts (Ide 2021; PNUD 2023) and yet, there is limited understanding of how to respond to compounded and interactive climate change and conflict effects. This underscores the need for comprehensive studies about the interactions between climate change and violent conflict in conflict-affected communities situated in understudied regions and using qualitative methods along with quantitative methods to better understand the socio-economic and political conditions of this interaction.

3.3 | Unanswered Questions in Climate Change–Conflict Relations

Climate change adaptation policies and projects need to carefully consider the socio-economic and political conditions of conflict-affected communities. Policies and projects to adjust to these circumstances and cope with climate change impacts will be necessary for maintaining human security[1] in many regions. However, the climate change-conflict literature is in general centered on a direct causal relationship between climate change and violent conflict, rather than how climate change impacts play out in conflict-affected communities (see Figure 3). Indeed, only 39 studies out of 212 (18.3%) analyzed the interactions between climate change impacts and violent conflict in conflict-affected communities. The other studies (81.7%) analyzed how to establish or prove direct causality between climate change and violent conflict. Given that communities in conflict-affected contexts have some of the "highest intersectional vulnerabilities to climate change" (Sharifi, Simangan, and Kaneko 2021), more studies focused on these interactions are needed. There is also a need to broaden the search of studies in languages other than English, because this may reveal understudied interactions of climate change and violent conflict.

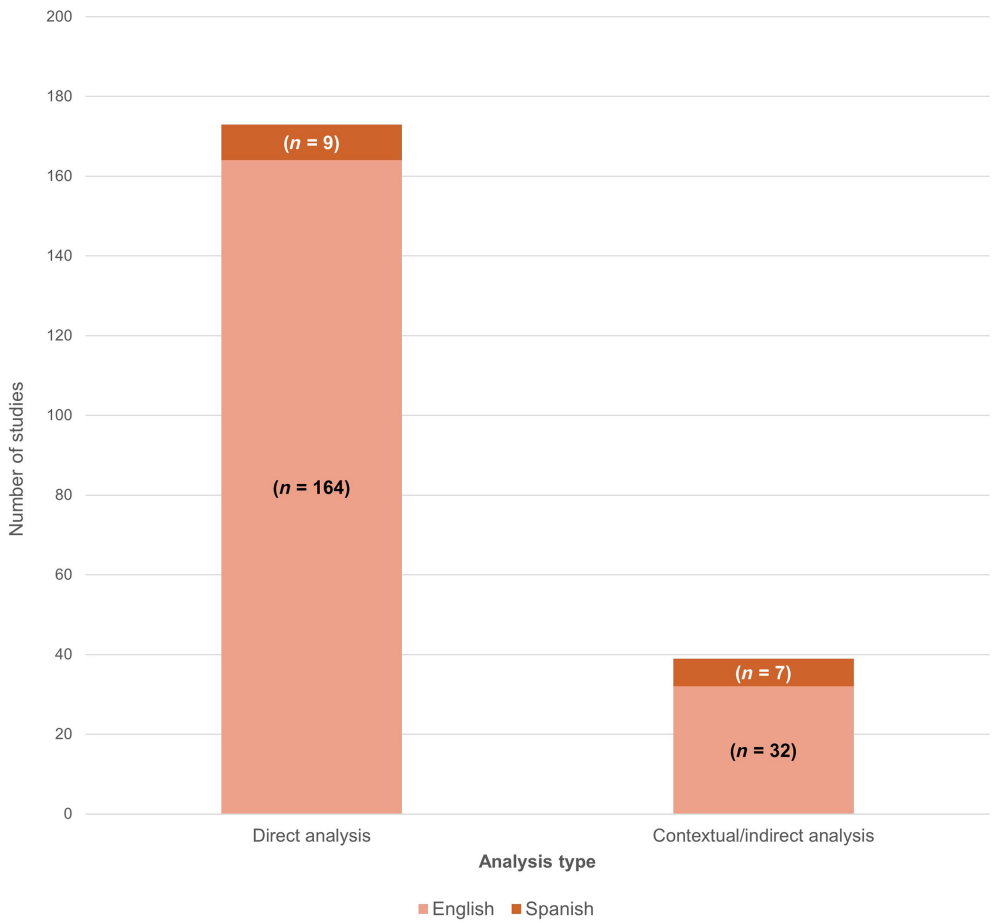

FIGURE 3 | Studies identified in our review examining a direct causal relationship (direct analysis) and a contextual or indirect relationship between climate change impacts and violent conflict (contextual/indirect analysis). Only 18.3% of the studies (39 out of 212) analyze contextual and indirect ways in which climate change can influence conflict in conflict-affected areas, and 81.7% of the studies (173 out of 212) analyze direct causality. Of these studies, only 7.547% (16 out of 212) are in Spanish.

4 | Implications For Future Research And Practice

Our review of the climate change-conflict literature from 2007 to 2023 highlighted important findings, concepts, and gaps. We found that most of the high-level existing research related to climate change and conflict remains focused on determining whether and how climate-related social–ecological changes cause conflict in a direct way in particular places. Even the systematic review studies (in Spanish and English) included in our review focused on empirical studies establishing a direct causal relationship between climate change and conflict (Abrahams and Carr 2017; Augsten, Gagné, and Su 2022; Gleditsch 2012; Hsiang, Burke, and Miguel 2013; Morales-Muñoz 2022; Scheffran, Kominek, et al. 2012; van Baalen and Mobjörk 2018). The analysis of climate change causing conflict and violence in a direct way has led to the initial formulations of a body of literature that has continued to shape many discussions since. Yet, we found that the evidence is inconsistent as to whether climate change is causally associated with violent conflict (Buhaug 2014; Meierding 2013; Scheffran and Battaglini 2011; Theisen, Gleditsch, and Buhaug 2013). While some empirical studies have found a direct causal relationship between climate change and conflict (Abdi, Mohamed, and Sugow 2023; Ani and Uwizeyimana 2020; Hoch et al. 2021; Lee et al. 2013; Wang et al. 2023), others find no causal relation (Crawford 2021; Mohamed and Nageye 2019; Tol and Wagner 2010) or an indirect one (Pacillo et al. 2022; Rowhani et al. 2011; Scheffran, Kominek, et al. 2012; Weir and Virani 2011; Wuebbles, Chitkara, and Matheny 2014; Yang et al. 2020).

Likely because of the disparities in the published literature, more recent research has argued that climate change does not cause violent conflict in a direct or deterministic way (Feitelson and Tubi 2017; Serdeczny et al. 2017; Temudo and Cabral 2023; van Baalen and Mobjörk 2016a, 2016b). Rather, it is argued that climate change likely increases the possibility of the onset of violent conflict through its interactions with social conditions, such as food insecurity, gender inequalities, land and ocean management, and limited access to resources (Gemenne et al. 2014; Mesjasz et al. 2011; Salehyan 2008; Scheffran, Brauch, et al. 2012; Spijkers et al. 2021). Communities experiencing social instability and conflict thus face a double or combined problem: climate change and violent conflict, which are mutually and negatively reinforcing. In these situations, climate change is likely to compound the consequences of violent conflict which, in turn, can increase vulnerability to the impacts of climate change (Buhaug and von Uexkull 2021; Furini 2019; Morello and Rizk 2022; Solomon et al. 2018). Yet we found that only a handful of studies provide empirical evidence of the interactions between climate change impacts and violent conflict in conflict-affected areas. These studies indicate that in conflict-affected areas social instability and conflict may reinforce a causal loop of conflict leading to climate change vulnerability and climate change to conflict vulnerability (Cappelli et al. 2023). As a result, communities in fragile, conflict-affected areas are highly vulnerable to climate change impacts (Kurtz and Elsamahi 2023), and yet, there is limited understanding of how to respond to compounded and interactive climate change and conflict effects within peacebuilding and climate change adaptation.

Peacebuilding is a complex, long-term process to facilitate conditions for human security (Vivekananda, Schilling, and Smith 2014b). This process is not limited to post-conflict reconstruction; it involves interventions that may precede and follow peace agreements to reduce the recurrence of conflict, promote economic recovery, and ensure sustainable environmental management (Rodriguez Garavito, Rodriguez Franco, and Duran Crane 2017). However, communities tend to face significant difficulties during peacebuilding processes in solving structural causes of conflict and implementing measures to manage and solve conflicts (Krampe 2019). The difficulties include sustaining security, finding financial support, and achieving development. Added to those difficulties are now the impacts posed by climate change, which could lead to greater instability or vulnerability (Hammill and Matthew 2010). For example, Nepal, in Southern Asia, began a peacebuilding process after a 10-year civil war. The civil war in Nepal was linked to poverty, inequality, and corruption (Matthew 2010). The peacebuilding process attempted to lessen poverty and improve communities' livelihoods, but Nepal's communities faced significant difficulties because of the persistence of the underlying causes of the civil war combined with climate change impacts. The Midland region was severely deforested and there was a shortage of wood and food (Vivekananda, Schilling, and Smith 2014b).

Climate change adaptation, in contrast, is the process of coping with climate change to reduce the negative impacts and build resilience (IPCC 2018). *Climate change adaptation* constitutes an important entry point for adjusting to climate change impacts and even building peace to avoid or reduce conflicts (Tänzler, Maas, and Carius 2010). For instance, climate change adaptation projects in Bangladesh have contributed to the "preservation of local ecosystems, livelihood, and political stability" and cross-case studies have found that transnational water management and conservation provisions in post-conflict agreements increase the probability of peace (Ide 2020).

Peacebuilding may also pose a significant opportunity to address security concerns and climate change impacts simultaneously, as recognized in the developing field of environmental peacebuilding (Ide 2020; Leonardsson et al. 2021; Simangan et al. 2021; Swain and Øjendal 2018). Peacebuilding may encompass economic aid, land reform, implementing natural resource measures, or facilitating reconciliation (Kurtz and Elsamahi 2023). The United Nations Environmental Program post-conflict assessments illustrate that investment in equitable environmental-sensitive strategies during peace transition processes may lessen incentives for conflict and enhance opportunities for durable and sustainable peace (Nicoson 2017; PNUD 2023; Stedman 2007).

Peacebuilding can contribute to resource restoration, and environmental management, and climate change adaptation to peacebuilding by eliminating or reducing ways in which environmental stress induced by climate change might increase the risk of conflict reoccurrence (Matthew 2014). Integrating peacebuilding and climate change adaptation will not be without its challenges, however. The long-term nature of climate change adaptation may be problematic in the search for a peace agreement that has short-term objectives and the need to find

an immediate end to violence (Leonardsson et al. 2021). For example, in Rwanda, when the civil war in 1994 ended, the government had to relocate displaced communities. During this process, protected forest areas, marshes, and hills were destined for settlement and farming. However, the relocation of displaced communities in these lands increased the communities' vulnerability to climate change as their exposure to climate extremes, such as landslides and floods, increased. Added to that, the relocation of protected lands may compromise environmental sustainability, which can undermine the ability of ecosystems to support human communities over longer timeframes (Hammill and Matthew 2010).

The studies reviewed indicate then that "climate change adaptation must be conflict-sensitive," and "peacebuilding must be climate-sensitive" (Abdenur and Tripathi 2022; Okpara, Stringer, and Dougill 2017; Witmer et al. 2017). However, peacebuilding and climate change adaptation are siloed in practice, in that their projects, actions, and goals are not conflict-sensitive or climate-sensitive (Buhaug and von Uexkull 2021) (see Figure 4). For example, peacebuilding projects (e.g., land restitution projects) typically do not have a climate change component and are therefore not built to withstand the impacts of climate change (represented as a disruption in Figure 4) (Eklöw and Krampe 2019; Krampe 2019). Likewise, climate change adaptation projects (e.g., blue carbon projects) do not typically have a conflict risk component, and thus are not built to respond to the consequences of violent conflict (represented as a disruption in Figure 4). There may be also negative feedback or loops from climate change adaptation that create or exacerbate violent conflict and that need to be considered by policymakers and academics (see Section 4.1).

Although existing research is beginning to recognize these dynamics and argue that it is necessary to integrate peacebuilding and climate change adaptation, we still need more empirical research providing direct insight into this topic. Empirical examinations of the interlinkages between peacebuilding and climate change adaptation are urgently necessary to respond to the compounded impacts of violent conflict and climate change. Gaining insight into these interlinkages will inform how to build capacities in conflict-affected communities to respond to violent conflict and climate change simultaneously, as well as to prevent unintended consequences, counterproductive feedback, or loops.

4.1 | Unintended Consequences, Feedback, or Loops of Peacebuilding and Climate Change Adaptation

Peacebuilding and climate change adaptation projects are implemented to reduce fragility, prevent conflict, and build resilience and peace (Matthew 2014). Yet, if designed and implemented without considering broader socioeconomic and political conditions these projects may create unintended consequences, or loops (also known as "maladaptation" or "boomerang effects") (Ide 2021; Rüttinger et al. 2015). For example, peacebuilding and climate change adaptation projects may aggravate existing inequalities or marginalization, limit access to land or water, increase environmental degradation and biodiversity loss, and/or undermine critical aspects of human security (Adger et al. 2014). These consequences often arise due to the absence of "cross-sectoral coordination" and, climate-sensitive or conflict-sensitive implementation of policies and projects (Okpara, Stringer, and Dougill 2018). For instance, the provision of financial aid in payment for ecosystem services as part of projects of Reduced Emissions from Deforestation and Forest Degradation (REDD), has been identified as a potential cause of conflicts and insecurity (Swatuk et al. 2021). In Tanzania and Congo basin, communities have opposed to REDD projects because of the loss of communal access to the forests and the outbreak of two social conflicts, the conflict between communities whose livelihood is based

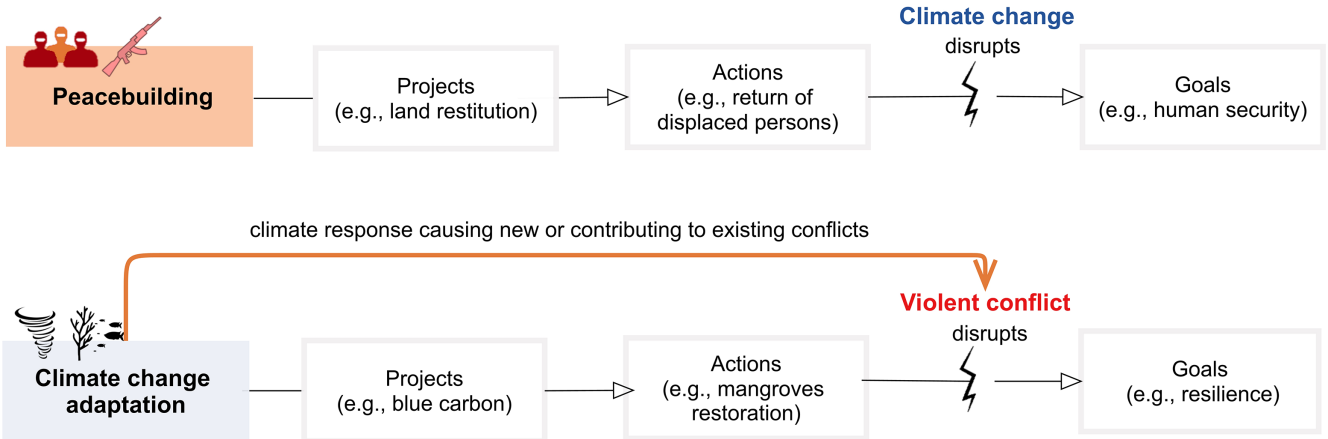

FIGURE 4 | Peacebuilding and climate change adaptation projects. In practice, peacebuilding and climate change adaptation are siloed, which can make it difficult to achieve human security and resilience. For example, peacebuilding projects (e.g., land restitution projects) do not tend to have a climate change component, and then, climate change impacts in the areas where the projects are implemented may disrupt (lightning bolt in the figure) the implementation of projects to respond to conflict and achieve human security. Similarly, climate change adaptation projects (e.g., blue carbon projects) do not tend to have a conflict risk component, and then new or existing conflicts may disrupt (lightning bolt in the figure) the implementation of adaptation projects to build resilience. In addition, sometimes there is counterproductive feedback, or loops on climate response causing new conflicts or contributing to existing conflicts (represented with the orange arrow in the figure).

on the forest and the government, and the conflict between local chiefs who are perceived as prioritizing private interests over communal needs, and the community members (Froese and Schilling 2019). Similarly, the conservation regime of the Peace Park ("Parque de la Paz" in Spanish) established in the "Cordillera del Cóndor" region (Condor Range) as part of the Peace Agreement achieved between Ecuador and Peru in 1998 has been controversial because of the loss of communal access to food and medicinal plants and the outbreak of a natural resource conflict between indigenous communities and mining companies (Ide 2021). Peacebuilding and climate change adaptation certainly do not always create unintended consequences or feedback. Studies included in this review provide insights into how peacebuilding and climate change adaptation can have substantial peace effects and build resilience (Fondo Colombia en Paz 2023). Still, academics, policymakers, and practitioners must know peacebuilding and climate change adaptation projects may cause exclusion, inequality, and conflict if the broader context is not considered. Also, we acknowledge that not being able to consider the unintended consequences, or loops of mitigation projects (Gilmore and Buhaug 2021) (to avoid and/or reduce "emissions of greenhouse gases into the atmosphere" [IPCC 2018]) in this review remains a limitation of our work and should be considered in future research.

4.2 | A Promising and Underdeveloped Research Agenda. Building Capacities in Conflict-Affected Communities

The impacts of climate change on conflict-affected communities, and the capacities they need to respond to climate change and conflict remain critical gaps in the studies we have reviewed. There is a prominent body of literature from political ecology and development studies establishing that violent conflict increases vulnerability and "undermines human security and the *capacity* of individuals, communities, and government institutions to cope with changes" (Blattman 2010; Leonardsson et al. 2021; Stewart and Fitzgerald 2000). Thus, a focus on human security and climate change impacts naturally leads to a focus on ways of reducing vulnerability, which is often addressed by building capacities (Cinner and Barnes 2019; Ide 2021). In this review, we found that various contextual factors causing or escalating violent conflict are underlying elements of vulnerability that indicate a lack of capacities. This points to the importance of developing projects and policies to build capacities for peace and adaptation including (but not limited to) consolidating the administrative and political capacity of institutions, providing financial and technological assets, and diversifying livelihood options (Adger et al. 2014; Salehyan 2008). Yet climate change impacts on communities that are experiencing violent conflict or have been in the recent past, and what capacities they might need to respond to the simultaneous impacts of climate change and conflict, remain critical gaps in the literature. Therefore, we stress as an implication for future research and practice, the need to understand more about capacity-building in conflict-affected areas. Such capacities are broadly defined as the conditions to anticipate and respond to changes (Barnes et al. 2020). These conditions can be driven by different related factors: assets, learning, agency, flexibility, organization, and socio-cognitive constructs in climate change adaptation (Barnes et al. 2020; Cinner et al. 2018; Cinner and Barnes 2019) and social, economic, and environmental conditions, governance and political, security, and truth and reconciliation in peacebuilding (Hammill and Matthew 2010). Such capacities have the potential to build resilience to climate change and may also contribute to the prevention of conflict (Ide 2021). Yet, existing research does not provide sufficient evidence of the capacities that communities in conflict-affected areas need to respond to the cumulative impacts of climate change and violent conflict.

The need to understand how to effectively build capacities to respond to climate change and violent conflict is particularly urgent since conflict-affected communities have typically fewer resources to respond, reduce, or recover from climate change impacts. Public services, such as health care, security, and food systems, are often absent or deteriorated, increasing the vulnerability to climate change while limiting recovery and development (Abrahams and Carr 2017; Morales-Muñoz 2022; Stein 2018). Key assets (e.g., infrastructure, economic aids) and social networks are also disrupted, especially when there are movement restrictions, resulting in limited sources of income (Fernández Arribas 2023; Martinez and Vergara Tamayo 2016; Sitati et al. 2021).

Peacebuilding and climate change adaptation actors need to identify better ways to respond to these challenges using integrated approaches. Places that are impacted by violent conflict and climate change face the overlapping issues of reducing the risk of relapsing into violent conflict, promoting economic recovery, and adapting to climate change (Castro Vargas 2021; Rodriguez Garavito, Rodriguez Franco, and Duran Crane 2017). Because of these overlaps, the same project or action may contribute to both peacebuilding and climate change adaptation in these places (Buhaug and von Uexkull 2021). For example, peacebuilding projects to consolidate the capacity, and effectiveness of the institutions (i.e., through functioning meteorological services) contribute to reducing conflict reoccurrence and to preparing for and reducing the impact of climate extreme events (e.g., storms and floods) However, there are gaps: peacebuilding projects do not tend to include a climate change dimension, and climate change adaptation projects are not built to respond to the consequences of violent conflict.

Drawing on the overlaps and gaps (see Figure 5) we consider that identifying the capacities that conflict-affected communities need to simultaneously respond to both climate change and conflict may maximize the synergies between climate change adaptation and peacebuilding. Applying theories and concepts of peacebuilding and climate change adaptation it is possible to define the capacities that build resilience and eliminate or reduce ways in which climate change might contribute to conflict reoccurrence (see Figure 5). Instead of being directed by possible risks, peacebuilding may use climate change adaptation as an opportunity to build a durable and sustainable peace, and climate change may use peacebuilding as an opportunity to build long-term resilience. A promising (and underdeveloped) research agenda that intends to build capacities in conflict-affected communities may maximize synergies between climate change adaptation and peacebuilding to sustain peace and resilience, strengthen governance, institutional and justice systems, and achieve broader social and economic development.

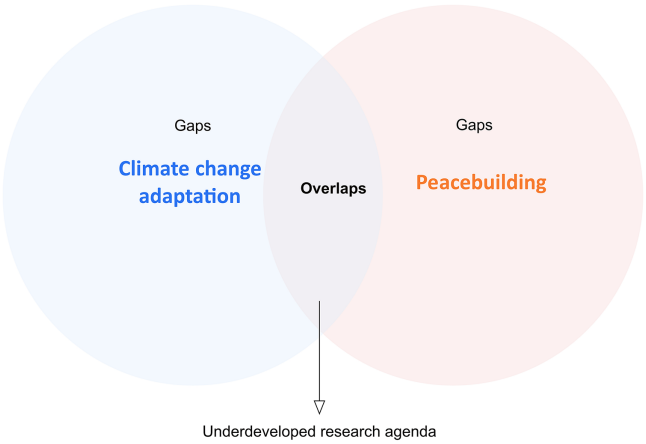

FIGURE 5 | A promising and underdeveloped research agenda. Building capacities in conflict-affected communities to maximize synergies between climate change and peacebuilding.

Climate change impacts that may drive or aggravate violent conflict are likely to become more common in the future, increasing concerns about the challenges of developing a research agenda in conflict-affected communities. The access to climate and conflict-affected communities in dangerous settings and the intervening variables and indirect effects of climate–conflict relations (climate change impacts in one area may cause conflict in another) (Ide 2017) constitute significant challenges to developing this research agenda (Hein et al. 2018). Meaningful research about climate change–conflict relations requires to consider the ways in which these impacts and local communities interact in different contexts and across scales.

5 | Conclusion

Climate change will have significant negative effects on SESs (IPCC 2022). These negative effects may cause violent responses in many regions and increase the risk of conflict outbreaks (Walby 2013). Conflict can force local people to move onto marginal lands, disrupt conservation projects, increase losses of biodiversity, and create livelihood crises (Lhoest et al. 2022).

Since the IPCC's 4th assessment report in 2007 and the first special session of the United Nations (UN) Security Council in the same year highlighted the risk of climate-related social–ecological changes causing violent conflict, scholars have dedicated much attention to establishing a direct causal relationship between climate impacts and the onset of conflict (Scheffran, Kominek, et al. 2012; Scheffran, Brauch, et al. 2012; Weir and Virani 2011). However, there remains a broader understanding of climate impacts in communities that are already experiencing violent conflict or engaging in peacebuilding processes, and how these cumulative impacts might affect efforts to build adaptive capacities to address climate change (e.g., climate adaptation projects) in the face of violent conflict.

Our review highlights the urgent need to study climate change impacts in conflict-affected communities, and their socioeconomic and political conditions. We also argue that there is an urgent need to provide empirical evidence of the interactions and synergies between climate change adaptation and peacebuilding. The study of these interactions will help to better understand how to design policies and projects that can help to build the necessary capacities to address the cumulative and synergistic impacts of climate change and conflict and to sustain peace.

Climate change will be a major driver of human security in the 21st century and beyond. A changing climate that significantly affects the social–ecological conditions where communities secure their livelihoods has the potential to create and escalate conflict. Climate change adaptation and peacebuilding projects will need to adjust to these circumstances to cope with the cumulative impacts of climate change and conflict. Otherwise, climate change adaptation and/or peacebuilding may not be effective, worsening security risks and, in turn, further reducing communities' ability to adapt to climate change.

Author Contributions

Luisa Fernanda Bedoya Taborda: conceptualization (lead), data curation (lead), formal analysis (lead), funding acquisition (equal), investigation (lead), methodology (lead), visualization (lead), writing – original draft (lead), writing – review and editing (supporting). **Michele L. Barnes:** conceptualization (supporting), data curation (supporting), formal analysis (supporting), funding acquisition (equal), investigation (supporting), methodology (supporting), supervision (lead), validation (lead), visualization (supporting), writing – original draft (supporting), writing – review and editing (lead). **Tiffany H. Morrison:** conceptualization (supporting), data curation (supporting), formal analysis (supporting), funding acquisition (equal), investigation (supporting), methodology (supporting), supervision (supporting), validation (supporting), writing – original draft (supporting), writing – review and editing (supporting).

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Related Wires Articles

Research methods for exploring the links between climate change and conflict.

Overcoming early career barriers to interdisciplinary climate change research.

Climate mitigation policies and the potential pathways to conflict: Outlining a research agenda.

Endnotes

[1] Human security is basically defined as "a condition that exists when the vital core of human lives is protected, and when people have the

freedom and capacity to live with dignity. The vital core of human lives includes the universal and culturally specific, material, and non-material elements necessary for people to act on behalf of their interests" Adger, W. N., J. M. Pulhin, J. Barnett, et al. 2014. Human Security. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.