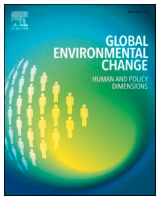
Global Environmental Change 98 (2026) 103151

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha



Integrating climate adaptation and peacebuilding: capacity development in climate and conflict-affected communities

Luisa Fernanda Bedoya Taborda [a,b,c,f,*], Tiffany H. Morrison [d,e], Michele L. Barnes [a,b,f]

[a] College of Arts, Society, and Education, James Cook University, 1 James Cook Drive, Townsville, QLD 4811, Australia
[b] School of Project Management, Faculty of Engineering, The University of Sydney, 21 Ross Street, Forest Lodge, NSW 2037, Australia
[c] Centre for Legal, Political and Social Research, Universidad de Medellin, Carrera 87 No. 30-65, Medellin, Colombia
[d] College of Science and Engineering, James Cook University, 1 James Cook Drive, Townsville, QLD 4811, Australia
[e] School of Geography, Earth and Atmospheric Sciences, University of Melbourne, Victoria, Australia
[f] Sydney Environment Institute, The University of Sydney, Camperdown, NSW 2006, Australia

ARTICLE INFO

Keywords:
Climate change
Adaptation
Conflict
Peacebuilding
Capacity building
Coastal communities

ABSTRACT

Communities living in areas impacted by armed conflict are increasingly vulnerable to climate change. These communities experience forced displacement, destruction of infrastructure, militarisation of land and water access, and movement restrictions that limit their capacity to adapt. Climate change adaptation and peacebuilding interventions focus on building capacities to prepare for and minimise the impacts of climate change and conflict. Yet, these interventions have traditionally been implemented in separate policy and practice sectors, with limited cross-sectoral interaction. This study identifies some of the overlaps between climate change adaptation and peacebuilding and explores ways to integrate these areas to respond to cumulative and reinforcing climate change and conflict impacts. Using a two-stage case study in a region affected by climate change impacts and armed conflict in Colombia, including semi-structured interviews and document analysis, we find that although climate change adaptation and peacebuilding interventions are rarely integrated, they overlap in potentially synergistic ways. We find six major areas of overlap: (1) access to information, (2) education, (3) social networks, (4) employment, (5) environmental management, and (6) healing. We also find two gaps (i.e., areas that were a major focus in one type of intervention but were not present or considered in the other): (1) protection and/or safety and (2) socio-cognitive constructs (e.g., social identity, risk perceptions). Building on these overlaps and gaps, we propose a new synergistic framework to integrate climate change adaptation and peacebuilding. This framework provides novel insights into how to develop adaptation and peacebuilding interventions to prevent reinforcing cycles, whereby conflict increases vulnerability to climate change and climate change increases the risk of violent conflict. We argue that using this framework provides an important step to building resilience and peace, thereby preventing maladaptation and the increase and/or redistribution of vulnerabilities.

1. Introduction

Communities affected by conflict are particularly vulnerable to climate change impacts and extreme events while also being less prepared to effectively adapt to these impacts (Kurtz & Elsamahi, 2023; Sitati et al., 2021; Vivekananda et al., 2014). Conflict causes social instability, forced displacement, and loss of livelihoods (Adger et al., 2014; Buhaug & von Uexkull, 2021; Martinez & Vergara Tamayo, 2016; Smith & Vivekananda, 2007). Many of these livelihoods are highly sensitive to climate variability, deepening communities' vulnerability to climate change and limiting their capacity to adapt. At the same time, climate change impacts exacerbate pre-existing political, economic, and institutional stressors within these contexts, increasing the likelihood of renewed tensions or violence. These dynamics create a self-reinforcing cycle where conflict and climate change interact and intensify each other over time (Bedoya Taborda et al., 2024; Buhaug & von Uexkull, 2021; Busby et al., 2013; Scheffran et al., 2019; Sitati et al., 2021). Conflict often increases vulnerability to climate change and climate change, the risk of conflict (Buhaug & von Uexkull, 2021; Mach, 2019; Sitati et al., 2021).

* Corresponding author at: School of Project Management, Faculty of Engineering, The University of Sydney, 21 Ross Street, Forest Lodge, NSW 2037, Australia.
E-mail addresses: lbed0921@uni.sydney.edu.au, luisa.bedoyataborda@sydney.edu.au (L.F.B. Taborda).

https://doi.org/10.1016/j.gloenvcha.2026.103151
Received 8 March 2025; Received in revised form 2 March 2026; Accepted 16 March 2026
Available online 26 March 2026

Climate change adaptation and peacebuilding; adaptation defined here as changes in social, economic, and ecological systems and peacebuilding as responses that support transitions out of armed conflict and prevent relapse into conflict (Chetail and Oliver, 2015; United Nations, 2010), focus on building capacities to prepare for and minimise climate and conflict impacts (Fernández Arribas, 2023; Ide, 2021; Pérez Marulanda & Castro, 2022). Yet, climate adaptation and peacebuilding interventions are usually implemented in sectoral silos- which at best creates missed opportunities for time and cost-efficiency (Buhaug & von Uexkull, 2021; Ide et al., 2023; Pernetta, 1992; Vivekananda et al., 2014), and at worst can create new risks, exacerbate existing vulnerabilities, or lead to unintended negative consequences (Barnett & O'Neill, 2010; Choudhury & Haque, 2016; Juhola et al., 2016; Schipper, 2020; Swatuk et al., 2021).

While climate change adaptation and peacebuilding interventions are often implemented in these sectoral silos they respond to many of the same pressures and have complementary goals (Abrahams, 2021; Abrahams & Carr, 2017; Barnett, 2019). For example, peacebuilding interventions often focus on consolidating the legitimacy, capacity, and effectiveness of institutions (i.e., through functioning meteorological services), which can also help communities to prepare for -and minimise- the impact of climate extreme events (i.e., storms and floods). Likewise, climate adaptation interventions often focus on providing assets for adapting to current and predicted climate change impacts, which can also help communities to recover from conflict by providing economic options; but there are some gaps: peacebuilding interventions prioritise protection, re-establishing public services, and economic aid, often without considering the risk of extreme climate events (Matthew, 2014; Mobaied & Rudant, 2019). Climate change adaptation interventions and donor requirements also tend to prioritise actions to prevent, minimise, and adapt to climate impacts without a "do not harm" component that would prevent interventions from worsening existing tensions (Hoch et al., 2021; O'Brien et al., 2008).

Understanding the interactions between climate change adaptation and peacebuilding is therefore key to responding to climate–conflict dynamics and enable responsible scaling of interventions (Hammill & Matthew, 2010; Matthew, 2014). Climate change and conflict literature has long-analysed the relationship between changing temperature and rainfall patterns and conflict-related variables (Buhaug, 2010; Busby et al., 2018; Hendrix et al., 2022; Ide, 2023; Mach et al., 2019; Raleigh & Urdal, 2007; Salehyan & Hendrix, 2014; Slettebak, 2012; Theisen, 2008; von Uexkull et al., 2020). However, there is less systematic and empirical evidence on how climate change adaptation and peacebuilding interact and prepare for and minimise these compounded impacts (Bedoya Taborda et al., 2024).

Drawing on climate change adaptation and peacebuilding theories, we empirically analyse the capacities that climate change adaptation and peacebuilding are building in a region impacted by climate change and armed conflict in coastal Colombia to uncover how these areas interact. This community faces increasing flooding, coastal erosion, conflict and social tensions over land and loss of livelihoods (Conservation International, 2021). To analyse the capacities climate adaptation and peacebuilding are building to respond to these impacts we first clarify our theoretical assumptions about the domains or components that climate adaptation and peacebuilding focus on to build capacities. We then introduce our case study and our methodological approach, which includes a qualitative analysis of climate change adaptation and peacebuilding interventions to gain a more holistic perspective of the overlaps and gaps between these two areas. The results from our analysis are then used to lay the groundwork for an integrated framework to build synergistic capacities in conflict-affected communities, rather than in isolation.

2. Climate change adaptation and peacebuilding: Conceptual overlaps and gaps

Climate change adaptation and peacebuilding involve many interventions focused on building capacities to respond to climate change and conflict impacts (Cinner & Barnes, 2019; Hammill & Matthew, 2010). These capacities are defined here as the underlying conditions that underpin the ability of communities to prepare for and respond to different impacts including those linked to climate change and conflict (Barnett et al., 2007; Coning, 2008; Grothmann & Patt, 2005; Mortreux & Barnett, 2017; Smit & Wandel, 2006; Smith, 2004; United Nations Environment Programme, 2009). Climate change adaptation literature refers to this as *adaptive capacity*, the foundations of which have been organised into different domains and concepts (Adger, 2003; Alkire, 2005; Bandura, 2006; Brown & Westaway, 2011; Coulthard, 2012; Grothmann & Patt, 2005; Hinkel, 2011; Pelling & High, 2005; Sen, 1999; Smit & Wandel, 2006; Yohe & Tol, 2002). Here, we draw on the six domains for building adaptive capacity to climate change outlined in the conceptualisation by Cinner, Barnes and co-authors (2020; 2018; 2019) because it was specifically developed for coastal communities and was based on a large body of literature on the determinants of adaptation or adaptive capacity. The six domains of adaptive capacity include: (1) the *assets* (i.e., financial, technological) that people have access to; (2) the *flexibility* of individuals and institutions to deal with changes; (3) the ability to *organise* (i.e., social networks and institutions) and share knowledge, cooperate, and access resources; (4) *learning* to recognise change, attribute this change to causal factors, and respond; (5) *socio-cognitive* constructs (i.e., personal experiences, perceived social norms, and cognitive biases) that enable or limit human behaviour; and (6) *agency* to determine whether to change or not (see Fig. 1) (Barnes et al., 2020; Cinner et al., 2018; Cinner & Barnes, 2019).

Peacebuilding literature also refers to specific areas or components for building capacities to reduce the risk of relapsing into armed conflict (Barnett et al., 2007; Coning, 2008; Organisation for Economic Cooperation and Development, 2008; Smith, 2004; United Nations Environment Programme, 2009). Here, we used the four components identified in a 2004 study led by the Peace Research Institute of Oslo (PRIO) because it considers an extensive range of peacebuilding interventions around the world and is consistently used in official documents by the Organisation for Economic Cooperation and Development (OECD) (2008) and the United Nations Environment Programme (UNEP) (2009). These four components include: (1) *social, economic, and environmental;* (2) *governance and political*; (3) *security*; and (4) *truth and reconciliation* components (see Fig. 1) (Hammill & Matthew, 2010). *The social, economic, and environmental component* comprises interventions to find a solution to the socioeconomic drivers of conflict (e.g., the marginalisation of social groups or environmental degradation). These interventions include resettling refugees, building infrastructure, providing public services (e.g., water and sanitation, education, and healthcare), generating employment, and economic compensation (Hammill & Matthew, 2010). The *governance and political component* comprise interventions to consolidate the legitimacy, capacity, and effectiveness of institutions. These interventions include strengthening political authority and administrative capacity, introducing participatory processes, capacity development for civil society, and anti-corruption interventions (Hammill & Matthew, 2010). The *security component* involves interventions for the protection and provision of state and personal security. These interventions include the disarmament, demobilisation, and reintegration of ex-combatants into civil society, humanitarian mine action, and strengthening judicial systems. Finally, the *truth and reconciliation component* comprises interventions to enable dialogue, peaceful resolution of disputes, healing, and justice (Hammill & Matthew, 2010).

Both climate change adaptation and peacebuilding domains and components bring about change by building capacities to respond to impacts or shocks. Due to their common objective of building capacities,

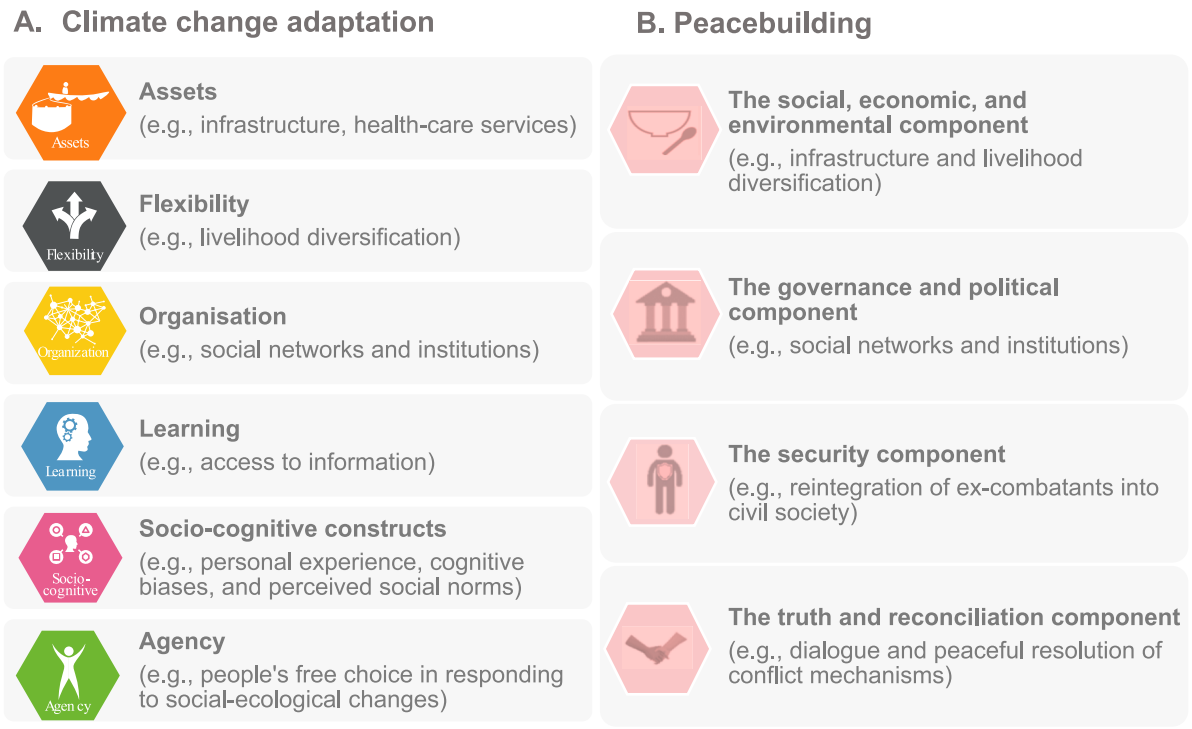


Fig. 1. Conceptual foundation of the study. A. Domains for building adaptive capacities to climate change (Cinner & Barnes, 2019). B. Components for building capacities for sustainable peace (Hammill & Matthew, 2010).

these domains and components often overlap. For instance, providing loans to fishers in conflict areas for purchasing fishing gear or boats may serve as a climate change adaptation intervention because it offers essential *assets*, and simultaneously may serve as a peacebuilding intervention because it economically supports conflict-affected fishers. Similarly, interventions that enhance the administrative capabilities of local councils may qualify as peacebuilding initiatives by strengthening governance and institutional capacity, while also contributing to climate adaptation through improved organisation, social support, and resource access. Yet, even if climate adaptation and peacebuilding overlap there are some gaps: peacebuilding interventions often focus on restoring security, re-establishing governance, and providing economic aid, but they rarely consider extreme climate events such as coastal flooding or storm surges. Likewise, climate adaptation focuses on preventing, minimising, and coping with climate impacts, such as planning and implementing interventions for coastal protection or education, without including a "do no harm" component to avoid increasing social or resource-based tensions. Here, we apply concepts of adaptive capacity and peacebuilding to a case study in Colombia to analyse these overlaps and gaps, as further outlined in the Methods section.

3. Methods

We used two data collection methods to inform our case analysis for identifying the capacities that climate change adaptation and peacebuilding interventions are building and for finding ways to integrate these areas. Methods included (a) semi-structured interviews with key informants and (b) document analysis. We first interviewed representatives of organisations and groups implementing climate change adaptation and peacebuilding interventions in the case study, and mangrove farmers or fishers who had participated in or who were involved in some way in these interventions. We then analysed reports and documents from the adaptation and peacebuilding interventions mentioned by the participants to obtain institutional, economic data, and context associated with the implementation of these interventions (see SI section A. for the analytic process). Using these methods, we were able to triangulate and validate our results.

3.1. Study area and context

The study area, Cispatá Bay, is located on the Caribbean coast of Colombia, in South America (see Fig. 2 A). To select the case, we considered five key factors: (1) impacts of climate change in the area; (2) active or past conflict; (3) climate adaptation and peacebuilding interventions in the area; (4) geographical underrepresentation in the literature on climate change and conflict; (5) and logistical capacity or necessary cultural knowledge and awareness with the area. South America met the first three criteria, and at the time we reviewed the literature, climate change and conflict studies were concentrated on certain regions of the world such as the Lake Chad Basin and the Horn of Africa. Meanwhile, other major regions, including Central and South America—both of which have experienced numerous conflicts and are highly vulnerable to climate change—were understudied, fulfilling the fourth criterion (Bedoya Taborda et al., 2024). Finally, our team included a Colombian researcher (lead author) with longstanding expertise in Colombian law, peacebuilding, local networks, cultural awareness and fluency in the language (Spanish), fulfilling the fifth criterion.

Cispatá Bay covers a 27,000-acre mangrove forest (11,000-hectare) connected to the Sinú River by canals and marshes (see Fig. 2 B). This Bay is an ecosystem of high productivity that provides food and protection from storm surges (Conservation International, 2021). The Bay is inhabited by coastal communities (almost 11.653 inhabitants) that have an economy based on agriculture, livestock and small-scale fishing (see Fig. 2 B). Approximately 90% of the inhabitants are local, while the remaining 10% are individuals displaced from other regions due to Colombia's armed conflict (Regional Autonomous Corporation of the Sinú and San Jorge Valleys CVS & Marine and Coastal Research Institute INVEMAR, 2010).

Armed conflict in Colombia dates back to about 1950, when armed groups began to settle in the Bay and exercise territorial control, leading to land dispossession, social network disruption, and limiting access to

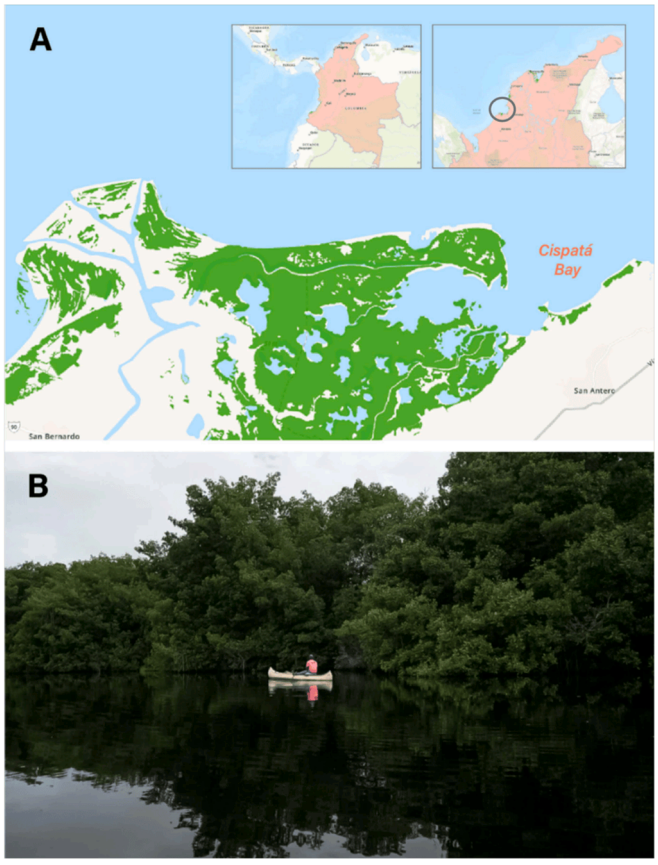


Fig. 2. Study area: Cispatá Bay in the Caribbean Sea. A. Map of Cispatá Bay with the mangrove area in green drawn in ArcGIS. B. Local fisher in Cispatá Bay navigates the canals that lead into and out of the mangroves (Ministry of Environment and Sustainable Development, 2021). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

marine fishery resources (Regional Autonomous Corporation of the Sinú and San Jorge Valleys CVS & Marine and Coastal Research Institute INVEMAR, 2010). The signature of the peace agreement in 2016 generated a decrease in violence and the development of more peacebuilding interventions such as land restitution, economic compensation, and reintegration to civil society of former combatants (Rodriguez Garavito et al., 2017). Yet, coastal communities of Cispatá Bay continued to face many difficulties associated with the consequences of armed conflict, including, limited institutional presence, unequal access to state resources, and the re-emergence of armed groups contending for control of illicit economies (Sharif & Carranza-Franco, 2025). These difficulties limited the effectiveness of interventions to sustain security, reduce the recurrence of violence, and generate stable economic opportunities, which are key conditions for long-term peace. At the same time, the impacts of climate change placed significant strain on the communities inhabiting the Bay. The Bay has experienced mangrove degradation, coastal erosion, saltwater intrusion, and recurrent flooding, all of which have impacted the main sources of local income, including fishing, aquaculture, and agriculture (Herrera Carmona et al., 2024; Rangel-Buitrago et al., 2015).

Conflict and climate impacts have thus created a compound or reinforcing cycle in the region. Limited institutional presence and insecurity have reduced the community's ability to plan or implement adaptation interventions, while climate impacts have intensified resource scarcity and loss of livelihoods, impacting peacebuilding interventions and increasing the risk of conflict recurrence. Coastal communities of Cispatá Bay have therefore been experiencing a double or combined problem: climate change and conflict.

Government institutions, non-government organisations, and international foundations have been implementing separated or "siloed" interventions to respond to climate change and conflict impacts in the Bay for about 30 years (Feola et al., 2015). We use the term 'intervention' to refer to planned and structured actions to achieve specific outcomes (Whyte & Mottee, 2022). This definition includes projects, programs, and initiatives implemented by climate adaptation and peacebuilding organisations. The interventions implemented in the case study included mangrove restoration, land restitution, ecological tourism, and carbon credits for carbon sequestration from mangroves (see Table 1). To identify the capacities climate change adaptation and peacebuilding interventions are building and find possible overlaps and gaps between them, we conducted 16 semi-structured interviews, and reviewed 45 supporting documents, analysing the secondary data contained within them (i.e., triangulation), which are described in the following sections.

3.2. Interviews

We conducted confidential, semi-structured interviews with 16 individuals living or working in the region, including mangrove farmers and representatives of organisations or groups classified as either 'climate change adaptation' or 'peacebuilding'. We classified the organisations by analysing their responsibilities and institutional declaration. 'Climate change adaptation' included both governmental and non-governmental organisations involved in and/or influencing responses to −or in anticipation of- changing climate conditions (Intergovernmental Panel on Climate Change, 2018) while 'Peacebuilding' included organisations involved in capacity building to reduce levels of violence, reconciliation, and social transformation in conflict-affected communities (United Nations, 2010). There are six organisations implementing climate adaptation and peacebuilding interventions in the study area; we interviewed participants from five out of these six organisations due to internal organisational restructuring in one of them. The interviews included questions about the eight interventions implemented in the Bay (Table 1), providing a comprehensive understanding of climate adaptation and peacebuilding in the study area. We also analysed reports and documents from the interventions to triangulate and validate our results.

The 16 interviews included nine from climate change adaptation organisations and seven from peacebuilding organisations most involved in the interventions. A list of these organisations can be found in the SI Section B, but the participants are anonymous for security reasons. In selecting participants, we considered criteria such as direct participation in the design and implementation of interventions, fieldwork, collaboration with the coastal community, and whether individuals directly drafted content in the reports. We contacted twenty-four representatives, but eight decided to not participate in the interview due to a stated, perceived lack of expertise in the relevant area. The other participants (n = 16) had extensive experience working with different groups in Cispatá Bay and represented a broad range of sectors, including the Judicial system (n = 1), Research Institutes (n = 1), International Foundations (n = 1), National Foundations (n = 1), National and Local government (n = 4), Environmental authorities (n = 1), and Community associations (n = 6) (see SI section C for detailed information on participants). The government and community associations' significant involvement in the interviews was probably due to the specific focus of the interventions. These were local initiatives within the Bay area, planned to benefit mangrove farmers and fishers' associations. Therefore, the main participants were local government and community-based associations.

Due to physical access limitations, participants consented to online interviews using Microsoft Teams in June and July 2023. Interviews were in Spanish, lasted 30 to 45 min and had a balanced demographic representation of men and women across age groups. This demographic was due to the diverse representation of climate change adaptation and

Table 1
Climate change adaptation and peacebuilding interventions[a] implemented in the region and mentioned by the participants or in the documents.

	Intervention	Activities	Goals
Climate change adaptation	**Mangrove restoration and conservation.** (Conservation International, 2021; Regional Autonomous Corporation of the Sinú and San Jorge Valleys CVS & Marine and Coastal Research Institute INVEMAR, 2010)	Reforestation and sustainable use agreements.	Conserve and restore mangrove ecosystems as natural buffers against flooding and coastal erosion.
	Blue carbon programs for local mangrove conservation and carbon credits. (Conservation International, 2021; Ministry of Environment and Sustainable Development, 2021).	Baseline assessment and carbon-stock measurement; mangrove conservation and restoration; generating carbon credits and financing; long-term monitoring and reporting.	Promote low-emission, climate-resilient livelihoods; create sustainable and legal income opportunities that reduce reliance on illicit economies (e.g., illegal logging, mining, or drug cultivation)
	Capacity building and environmental education programmes for local fishers and farmers. (Ministry of Environment and Sustainable Development, United Nations Development Program and Ministry of Foreign Affairs of Colombia, 2019; Omacha Foundation, 2022)	Workshops and courses on sustainable harvesting, coastal management, and climate awareness	Contribute to community-based climate governance and sustainable resource management.
	Development of ecosystem monitoring and early-warning systems for coastal flooding and erosion (Marine and Coastal Research Institute INVEMAR, 2010; Regional Autonomous Corporation of the Sinú and San Jorge Valleys CVS, Marine and Coastal Research Institute INVEMAR, 2010)	Early-warning protocols for coastal flooding; risk communication and preparedness training	Improve local adaptive capacity in response to sea-level rise, flooding, and coastal erosion.
Peacebuilding	**Community reintegration and reconciliation programmes for ex-combatants and affected families** (Foundation Ideas for Peace, 2019; Ministry of Environment and Sustainable Development, 2017)	Collective environmental and/or social programmes such as mangrove restoration	Facilitate the social and economic reintegration of former combatants into civilian life; prevent relapse into violence
	Reparation and compensation programmes (Unit for Victims, 2023)	Determination and payment of compensation amounts; livelihood and housing initiatives; monitoring, follow-up and institutional coordination	Material restitution and inclusion for victims of homicide, forced disappearance, kidnapping, injuries, or illegal recruitment during armed conflict; support the economic stability and social reintegration of victims of armed conflict
	Capacity-building on conflict resolution, economic compensation, leadership and local peace governance (Ministry of Environment and Sustainable Development, 2017)	Workshops and courses on conflict resolution, economic compensation leadership, and local peace governance.	Build local leadership capacity for inclusive peacebuilding and participatory governance, and institutional capacity and trust between communities and local authorities
	Land Restitution programmes to return abandoned or dispossessed lands to victims of armed conflict (Rural Agricultural Planning Unit, 2023)	Claim registration and verification; land registration; physical return and land use; compensation and alternative reparations.	Restore land rights to victims of displacement and dispossession under the Victims and Land Restitution Law (Law 1448 of 2011); improve tenure security and social stability; promote sustainable land use and livelihoods.

[a] **Note:** Participants and documents did not consistently refer to the same interventions or use the same terms. Some described individual actions, such as workshops or mangrove planting, instead of interventions, while others mentioned a "project" or "programme" without providing details of their goals or the title. However, for consistency we use here the word intervention.

peacebuilding interventions in the study area.

The interview questionnaire included questions about type of interventions, goals, and actions involved, such as training, infrastructure, and restoration practices. There were also questions about the difficulties participants have faced and the alternatives or solutions they have considered. Some specific questions included *a. How long have you been with this organisation? b. What are the interventions your institution, foundation, or organisation has implemented in the area? c. Has climate change impacted your ability to implement the intervention?* There were no questions that required participants to identify or discuss their position about armed conflict or conflict groups due to ethical considerations.

During the consent process, participants were informed that no identifying information would be published and that secure, university-approved encrypted platforms were used to protect data and maintain participant confidentiality. Previous experience in the area, knowledge of Spanish, and local sensitivities were also considered for ethical and culturally appropriate field research.

Interviews were transcribed verbatim from Microsoft Teams notes and translated from Spanish to English. The first and second authors jointly developed the coding framework, and the first author coded all interviews using QSR NVivo 20 qualitative data analysis software. Interviews were coded deductively and inductively to generate key themes, as detailed in the Data Analysis section.

3.3. Document and secondary data analysis

Document analysis included institutional reports, assessments, and organisational documents (n = 45) from peacebuilding and climate change adaptation interventions implemented in the Bay. These documents, published between 2010 and 2023 in Spanish and English, contained qualitative and quantitative data (see Table 2). To analyse the documents, we used a three-step process: an initial review, a coding process in the QSR NVivo 20, and a detailed examination and interpretation of the documents. Documents were coded deductively and inductively to generate key themes, as detailed in the Data Analysis section. We first coded the interviews and, second, the documents to find additional data associated with the implementation of the interventions mentioned in the interviews. This data included institutional and economic data, enabling triangulation and process-tracing of changes in the livelihoods and economy of the coastal community (see SI section D for a list of the documents analysed in this study). Information derived from interviews is indicated by references to participants (e.g., participant 3), while information drawn from the documents analysed in the case study is cited or referenced in the Results section.

3.4. Data analysis

Data analysis consisted of identifying and reporting patterns or themes within the data and analysing the patterns (Braun & Clarke, 2006) (see the SI Section A for the analytic process). First, we used a deductive or theory-driven method (Boyatzis, 1998; Fereday & Muir-Cochrane, 2006; Hyde, 2000) to predefine themes and sub-themes and code the interviews and documents (see Table 3). These themes and subthemes were derived from the climate change adaptation and peacebuilding domains and components mentioned in Fig. 1 and widely used in each field. We then used an inductive method to find repeated patterns of meaning or themes from the participants' responses and identify difficulties or limitations to implementing climate change and peacebuilding interventions and some solutions.

We systematically coded interview and document data using the predefined themes and sub-themes mentioned in Table 3. First, we organised interview and document data in NVivo 20 to identify the specific capacities that adaptation and peacebuilding organisations or groups were building in the study area. Second, we classified these capacities into climate adaptation domains or peacebuilding components. For example, coded capacities for "education" were classified into the *learning* domain of climate adaptation, and capacities coded for "anti-corruption" were classified into the *social, economic and environmental* components of peacebuilding. Third, we analysed the overlaps and gaps between coded capacities. Coded capacities for both climate change adaptation and peacebuilding were considered overlaps; coded capacities for one area were considered gaps.

Table 2
Documents consulted in the case study.

Category	Examples	Number
Official documents	Statements and declarationsInstitutional reports	18
Organisational documents	Midterm or final reports EvaluationsCommunications	8
Scholarly work	Scientific or peer-reviewed publicationsMaster's or doctoral dissertations	9
Media and communications	Newspaper and magazine articlesPamphlets, and web pages	10
	Total	45

Using an abductive method or iterative analysis (Tavory & Timmermans, 2014) we compared the overlaps and gaps we found in the case study with those previously identified in the literature (see section about conceptual overlaps and gaps) and developed a framework for integrating climate change adaptation and peacebuilding. The iterative comparison helped us identify differences and similarities between literature and practice and whether other overlaps or gaps were perceived. This process contributed to the development of a framework based on climate and conflict realities that can be applied or tested in other case studies.

During data analysis we also assigned attributes to the interview and document data to analyse the relationships between climate change adaptation and peacebuilding organisations. The attributes included the area (climate change adaptation or peacebuilding), position within the organisation (i.e., entry-level, middle-level, top-level), type of organisation, organisation's geographic area of influence (i.e., national or international), experience in the area (i.e., number of years in the area), and ties or connections to organisations within the same area or different area (see SI Section C for information on attributes). Based on these attributes, we identified different relationships between climate change adaptation and peacebuilding organisations in the Bay. To illustrate these relationships, we elaborated a sociogram in NVivo 20 (see Fig. 6).

An important clarification is that we did not compile a definitive list of interventions and their specific goals. Given the research question (RQ: What capacities are climate change adaptation and peacebuilding building, and how do they interact?) we were focused on capacities rather than adaptation outcomes. Also, as it is common in qualitative research, the participants and the documents did not consistently reference the same interventions or use the same terms. Some described individual actions, such as workshops or mangrove planting, instead of interventions, while others mentioned a "project" without providing details of the project's goals or the title. For clarity and consistency, whenever reference to these activities is necessary, we use the term intervention as a concept that includes the different terms used by participants or in the documents.

4. Results

The coastal community of Cispatá Bay has been participating in climate change adaptation and peacebuilding interventions for over three decades (Conservation International, 2021). These interventions have been implemented by environmental authorities, local NGO foundations, international foundations, national and local governments, and community-based associations of mangrove farmers (Conservation International, 2021). The interventions implemented in the Bay included mangrove restoration, blue carbon sequestration, land restitution, compensation for loss or damage, ecological tourism, and ecosystem-based adaptation. In the interviews, participants (1, 2, 3, 4, 5, 8, and 12) emphasised that these interventions have been effective in reducing social tensions and conflict and helping the community adapt to the impacts of climate change.

We also found that climate adaptation and peacebuilding organisations in the Bay were building capacities for climate adaptation and peace in separate, often siloed interventions. Climate adaptation interventions centred on building adaptive capacities in the domains mentioned in the conceptual section: assets, flexibility, organisation, learning, socio-cognitive constructs, and agency. Peacebuilding interventions centred on building capacities in these components: social, economic and environmental, governance and political, security, truth and reconciliation, also mentioned in the conceptual section. However, these capacities, developed for different domains and components, often overlapped because climate adaptation and peacebuilding responded to similar pressures. Many of the skills, resources, and relationships developed by climate adaptation and peacebuilding interventions

Table 3
Themes and sub-themes. The icon beneath each theme or sub-theme represents the conceptual domain or component it refers to, as outlined in Fig. 1.

Climate change adaptation		Peacebuilding	
Domains (or themes)	**Sub-themes**	**Components (or themes)**	**Sub-themes**
Assets	• Financial • Technological • Social investments	Social, economic, and environmental	• Infrastructure • Public services • Employment • Technical and financial assets • Environmental management
Flexibility	• Livelihood diversification • Diverse practices	Governance and political	• Institutional capacity • Participation • Anti-corruption
Organisation	• Institutional capacity • Social networks	Security	• Protection and safety • Judicial or justice system
Learning	• Education • Access to information • Beliefs • Memory	Truth and reconciliation	• Conflict resolution • Memory • Healing • Return and relocation
Socio-cognitive constructs	• Risk attitudes • Past experiences • Social norms • Cognitive biases		
Agency	• Active in decision-making • Self-efficacy		

responded to related problems, such as environmental stress, social tensions, and economic insecurity. Because of this, they often developed the same types of capacities, for example, cooperation, trust-building, local organization, and livelihood diversification, which created a reinforcing interaction.

We identified six major overlaps between climate change adaptation and peacebuilding: access to information, education, social networks, employment, environmental management, and healing (see Fig. 3). There were also two gaps (i.e., areas that were a major focus in one type of intervention but were not present or considered in the other): protection and/or safety and socio-cognitive constructs (see Fig. 3).

4.1. Overlaps between climate change adaptation and peacebuilding in the case study

The overlaps outlined above show that many capacities developed either by climate adaptation interventions or peacebuilding interventions were also developed by the other area. We found that climate change adaptation interventions most overlapped with peacebuilding in building these capacities: access to information, education, and social networks (see Fig. 4, A). While peacebuilding interventions overlapped with climate adaptation in employment, environmental management, and healing (see Fig. 4, B). These major overlaps are discussed in detail in the following sections.

4.1.1. Access to information and education

We found that climate adaptation interventions in Cispatá Bay, Colombia were often developed to provide information and education on mangrove restoration, biodiversity, and eco-tourism, which was also important for peacebuilding. These interventions helped local communities to reduce their dependence on fishing and unsustainable practices. Mangrove farmers described how local fishers involved in crocodile hunting *(Crocodylus acutus)* and logging started working in mangrove restoration and eco-tourism after participating in the education interventions (participants 13, 14 and 15). These changes in thinking and behaviour were important for climate adaptation but also peacebuilding. Local fishers and mangrove farmers described that, social tensions over crocodile hunting and mangrove logging decreased when they learned about mangrove restoration, eco-tourism and other ways of making a living:

> *"Crocodiles were critically endangered in the area 15 years ago. But the regional environmental authority helped to create a local association to monitor the population, collect the eggs and release mature individuals back into the wild. Thanks to community efforts, hunters became crocodile custodians — resulting in the rehabilitation and release of nearly*

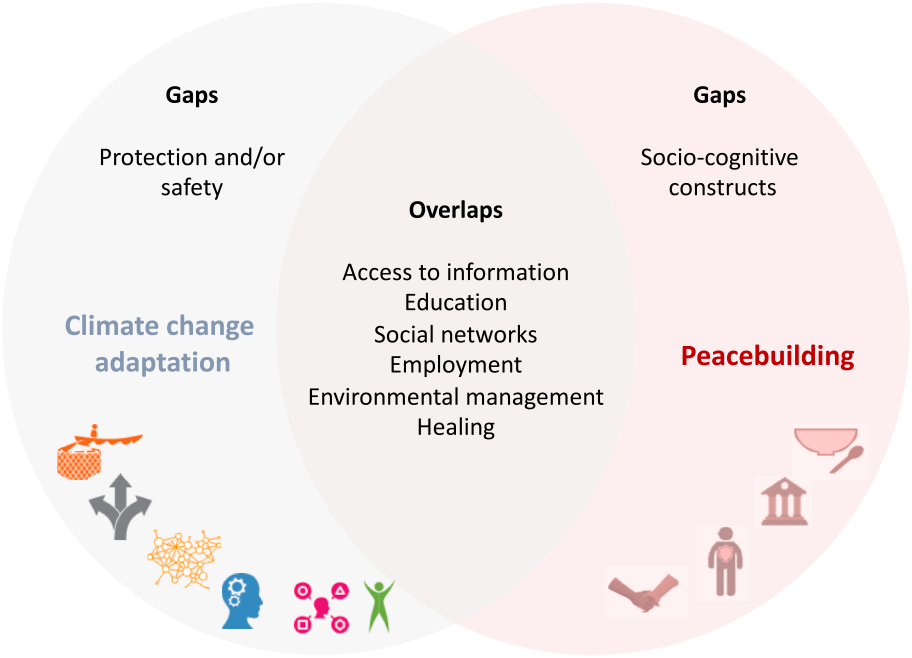


Fig. 3. Major overlaps and gaps between climate change adaptation and peacebuilding in the case study. This figure shows the major overlaps and gaps between climate change adaptation and peacebuilding interventions in the case study. The other overlaps and gaps are detailed in the SI Section E.

10,000 crocodiles in Cispatá Bay, eco-tourism projects and less tensions" — participant 13 from a community association working in climate change adaptation.

Peacebuilding interventions also provided information and education to local communities in the Bay, including remote areas, through the operation of 'Mobile units for conflict victims' assistance and guidance'. These 'Mobile units' (or big trucks) have been going to remote areas to provide information about transitional justice mechanisms, support systems, reparative measures, and land restitution. Representatives of peacebuilding organisations mentioned that because of the 'Mobile units', many individuals in the Bay received information and legal advice about human rights and legal procedures (participants 6 and 7). These peacebuilding interventions contributed to more inclusive learning processes, which were important for peacebuilding and also climate adaptation. Without the material access to information and education, training and workshops on adaptation and peace have often reinforced inequalities and power imbalances in the region.

4.1.2. Social networks

We found that some of the interventions implemented in the Bay provided network training and social support to adapt to climate change, including establishing a board to build networks between mangrove farmers and climate adaptation organisations. One participant commented in the interview that the board meets fortnightly to analyse the implementation of adaptation interventions and how they use their funds or money, *"(…) everything in the Bay is consulted with the communities"* (participant 8).

We also found peacebuilding interventions to facilitate collaboration and provide social support. These interventions established a board to build networks between the government and conflict-affected mangrove farmers. The board evaluates community needs and development projects: *"(…) they are like a participation instance where they [conflict-affected mangrove farmers] can monitor the different projects"* (participant 6). These overlapping adaptation and peacebuilding interventions have increased cooperation and social support in the Bay; however, they focus on connecting the organisations working within the same area (i.e., climate change adaptation *or* peacebuilding) instead of across (see Fig. 6). Because of this siloed implementation, there are clusters of organisations working separately that may not be effective in reducing climate vulnerability and levels of conflict. We discuss ways to integrate climate change adaptation and peacebuilding in the section "Breaking the silos".

4.1.3. Employment

In the Bay, some of the climate adaptation interventions were planned for providing jobs and reducing dependence on fishing. *"There are hundreds of families living and working with the mangroves. The 'mangleros' [or mangrove farmers in English] are part of a network of local mangrove associations formed to conserve and protect the mangroves"* (participant 8). These employment solutions have provided income and access to economic resources to mangrove farmers, but the solutions are often short term or temporary. When the project or funding ends, mangrove farmers are unemployed and turn to fishing or sometimes logging (participants 1, 2, 3, 4, 5, 8, and 12).

Peacebuilding interventions also involved agriculture and farming projects which contributed to income generation, food security, social reintegration, and local stability. These factors are key for preventing a relapse into conflict and increasing flexibility associated with livelihoods and income, all of which are important and well-recognised determinants of climate change adaptation. This overlap suggests that employment and livelihood opportunities are shared capacities for building resilience and stability.

4.1.4. Environmental management

Climate adaptation interventions often have a strong focus on managing and conserving the environment to reduce climate vulnerabilities. However, peacebuilding interventions also focus on governing, managing, and conserving natural resources and the environment to support durable peace (Fondo Colombia en Paz, 2023; Martinez & Vergara Tamayo, 2016). Some of the peacebuilding interventions involved payment for ecosystem services (PES), agroforestry systems, coffee and cocoa plantations, beekeeping, aquaculture and ecosystem-based adaptation that have reduced confrontations in the area (participants 9, 10 and 12). In these ecosystem-based adaptation interventions in particular, communities use the carbon value generated through the conservation and restoration of mangroves to contribute to a long-term

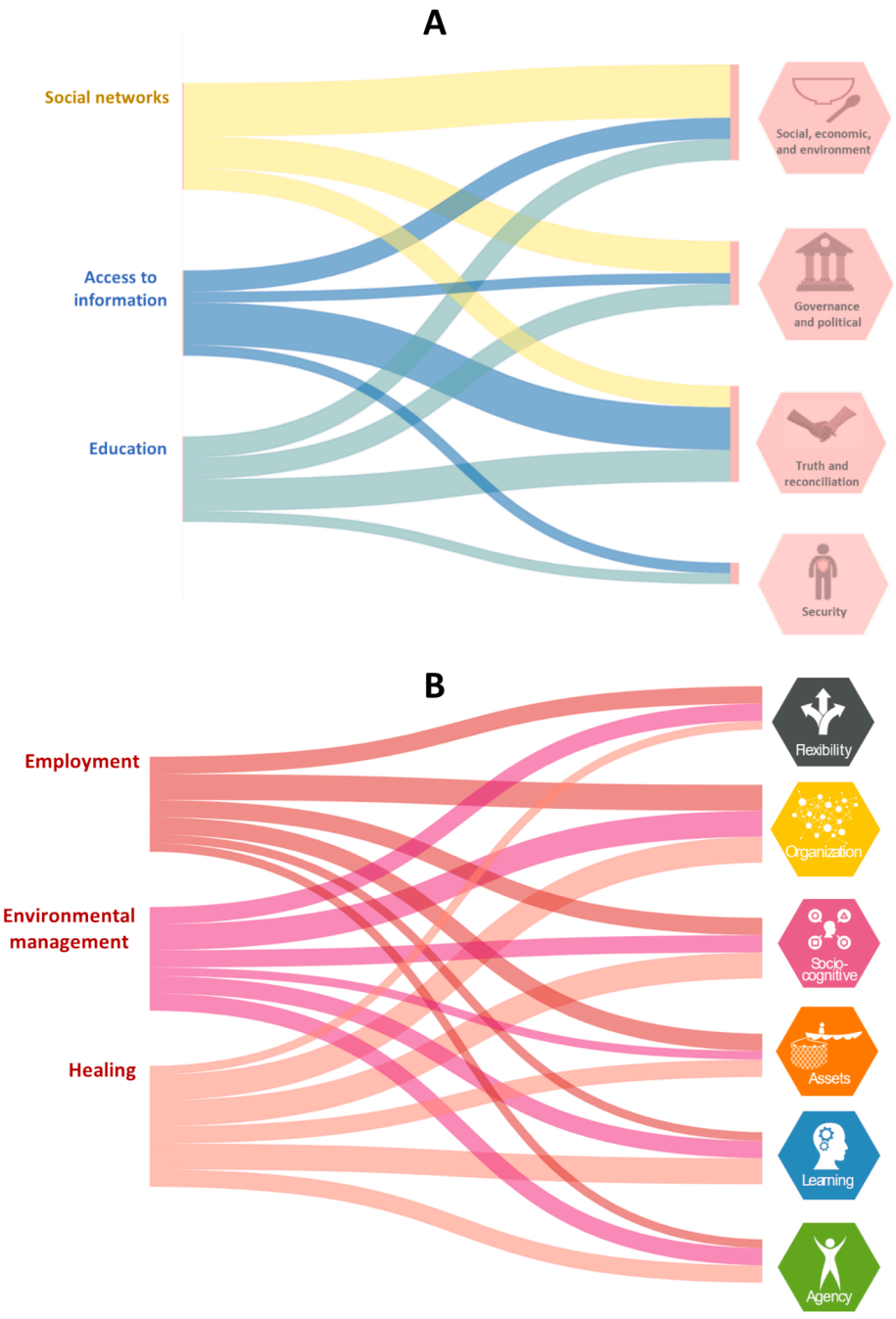


Fig. 4. Overlaps between climate change adaptation and peacebuilding interventions identified in the interviews and documents. (A) shows how capacities in climate change adaptation (left) overlap with peacebuilding components (right). Yellow represents social networks (linked to the *organisation domain*), and blue and green, access to information and education (linked to the *learning domain*). (B) shows how capacities in peacebuilding (left) overlap with climate change adaptation domains (right). Dark red and pink represent employment and environment (linked to the *social, economic, and environmental component*), and light pink for healing (linked to the *truth and reconciliation component*). The width of the lines indicates the extent of the overlap as identified in our empirical study (i.e., interviews and documents). Therefore, lines are thicker when many capacities were coded as relevant for both climate adaptation and peacebuilding (see SI Section E for detailed information on the overlaps). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

sustainable financing strategy. These interventions have created synergies between climate change and peacebuilding by using natural resources and ecosystems for adaptation and peace. Sustainable resource management practices that prioritise equitable access to natural resources and minimise conflicts constituted the basis for building solidarity and trust in the Bay to both prevent conflict and adapt to climate change.

4.1.5. Healing

In conflict-affected communities, the recovery and healing of communities exposed to prolonged and complex violence is well recognised as an important element in building peace. Yet we found that interventions focused on recovery and healing can indirectly support climate change adaptation. In Cispatá Bay, some of the peacebuilding interventions included reconciliation projects to provide psychological assistance for emotional support, healing and wellbeing. Components of these interventions have focused on supporting occupational changes,

providing education, and rebuilding homes destroyed in violent confrontations. Such capacities represent important conditions for adapting to climate change impacts. Occupational changes from agriculture or fishing to eco-tourism build flexibility, and flexibility is a critical domain of building adaptive capacity to climate change. Provision of access to information and education is central to the learning domain of adaptive capacity, whereas rebuilding infrastructure links to the assets domain.

Peacebuilding interventions focused on recovery and healing can also directly support climate change adaptation. If communities do not feel secure or have the emotional willingness or readiness to begin dialogues, this may constitute a competing concern that stalls or impedes any effective action against climate change, especially collective action. When there are significant stressors, such as violent conflict, adapting to climate change is not prioritised because of concerns about resistance and survival. Therefore, peacebuilding interventions on psychological or psychosocial assistance are critical because they reduce those concerns and enable communities to adapt to climate change.

4.2. Gaps between climate change adaptation and peacebuilding in the case study

While there is a growing recognition that climate change adaptation may need to consider the conflict context and that peacebuilding considers climate-related risks, there are some gaps, as mentioned in the conceptual section. Some areas that were a major focus in one type of intervention were not present or considered in the other. In Cispatá Bay, Colombia, we found major gaps related to socio-cognitive constructs – a critical determinant of climate change adaptation, and protection and/or safety – which is a central component of peacebuilding.

Socio-cognitive constructs are concepts that individuals use to understand and interpret interactions and conditions. These constructs include beliefs, attitudes, past experiences, and cognitive processes that influence how people perceive and respond to their environment. Though such constructs have been identified as critical for supporting (or impeding) climate change adaptation we found that – at least in the case of Cispatá Bay, Colombia – peacebuilding interventions did not include specific practices or actions that directly considered socio-cognitive constructs. Only some interventions, particularly those centred on healing, implicitly developed socio-cognitive constructs, whereas climate change adaptation interventions included specific actions to develop these constructs, such as workshops on leadership and social identity formation. One participant described practical training in problem-solving, decision-making, finances, project management, community storytelling and cultural recognition (participant 6).

We also found that climate change adaptation interventions did not include specific practices or actions centred on protection and/or safety which tend to be a key priority in peacebuilding. Yet, while peacebuilding organisations implemented interventions focused on safety in Cispatá Bay, Colombia, we found respondents refer to the interventions as inadequate and inefficient to provide protection and/or safety (participants 1 and 12).

> *"(…) we are often afraid that we might do something and that we might have reprisals from these people, that they might want something from what we do, so under these circumstances, we do not really feel protected or safe"* — participant 9 from a community association working in peacebuilding.

Our results suggest that these gaps are barriers for the integration of climate change adaptation and peacebuilding and may increase or redistribute vulnerabilities (also known as maladaptation or boomerang effects) (Ide, 2020; Rüttinger et al., 2015). For example, adaptation and peacebuilding interventions to provide employment and assets (such as fishing gear or livestock) have unintentionally reinforced cycles of dependence and economic instability because local communities continue to feel unsafe or distrust institutions. To break these cycles, adaptation and peacebuilding interventions may need to include protective and socio-cognitive dimensions that prevent the accumulation of vulnerabilities and avoid maladaptive feedback loops in climate–conflict dynamics.

4.3. Limitations to implementing climate change adaptation and peacebuilding interventions in the case study

Participants living or working in the Bay mentioned three major limitations to implementing climate change adaptation and peacebuilding interventions: (i.) land and marine use planning, (ii.) conflict dynamics, and (iii.) place attachment (participants 1, 2, 3, 4, 5, 8, and 12).

4.3.1. Land and marine use planning

Participants emphasised that competing uses of land and marine ecosystems limited the implementation of climate adaptation and peacebuilding interventions. While there are interventions to protect coastal and marine ecosystems, mangroves continue to be cleared for cattle, shrimp farming, and agriculture because farmers move their fences further into the forest during the dry season. This is the case of mangrove-land interface sites and beaches where mangroves are being replaced by coconut and rice crops. While some organisations have implemented adaptation and conservation interventions to prevent mangrove deforestation, they lack the financial resources and institutional capacity to enforce compliance. These unplanned land and marine-use changes in the area are causing ecological and social impacts, such as the degradation of mangroves (which increases community vulnerability to climate change) and social tensions. To overcome these limitations and find a balance between competing concerns (e.g., economic development and conservation), climate adaptation organisations are implementing Integrated Coastal Management plans (ICM), and Marine Spatial Planning (MSP). ICM and MSP have been implemented in the region to resolve inter-sectoral and cross-border tensions over marine and coastal resources. These land and marine use plans promote the integration of economic and social goals into ecosystem planning, providing an opportunity to integrate climate change adaptation and peacebuilding in the region.

4.3.2. Conflict dynamics

Armed conflict in Colombia is a phenomenon influenced by complex socio-political conditions (Rodriguez Garavito et al., 2017). These include changes to national security policies, the influence of illicit drug groups, and limited state presence (Sosa, 2023). The signature of the peace agreement between one armed group and the government of Colombia in 2016 decreased the levels of violence and confrontations, but some armed groups still control territory and benefit from illicit economies (Rodriguez Garavito et al., 2017). Participants mentioned that Colombia has a "permanent conflict" or "latent conflict", wherein even in the absence of direct violence, various tensions and injustices persist (Tamayo-Agudelo & Bell, 2019).

> *"They (armed groups) know what I do and what I don't do. They know what I have, what I spend, and how I spend it. They might even do something if they don't like my behaviour, but the truth is that we haven't had big confrontations in the last years,"* — participant 9 from a community association working in peacebuilding.

These complex conflict dynamics have been limiting the implementation and effectiveness of climate change adaptation and peacebuilding interventions (participants 1, 2, 3, 4, 5, 8, and 12). The end of the long-armed conflict and signature of the peace agreement opened previously inaccessible areas to economic activity, infrastructure development, or extractive industries, which may increase deforestation and environmental pressures for the cultivation of illegal crops and cattle farming. There are also informal extractive economies, such as illegal mining, that increased because of limited state capacity and enforcement (Cantillo & Garza, 2022; Pérez-Rincón et al., 2022).

In Cispatá Bay, Colombia, climate change adaptation interventions are establishing dialogue spaces and supporting informal conflict resolution mechanisms to de-escalate tensions and build resilience. Participants stated that they are starting dialogues with groups of cattle farmers to stop logging *"We need to go slowly and try to convince them without causing conflicts. We have identified some of the farmers with whom we could start working and they could become an example for the rest"* (participant 3).

State presence and networks have also facilitated cooperation to achieve shared goals and reduced intergroup conflict (participants 9, 10, 11, 14, and 15). Communities living in Cispatá Bay mentioned that strong connections with the government contributed to a sense of physical security and building trust (participants 9, 10, 11, 14, and 15), which helped to reduce levels of conflict and improve environmental governance, restoration, and inclusive resource management over the long term.

4.3.3. Place attachment

Place attachment describes the cultural connection that individuals or communities have to a specific location or environment. This attachment is often rooted in the experiences, memories, and cultural significance associated with a particular area and can influence how people perceive and respond to changes. While place attachment is recognised to often inhibit the flexibility to relocate or make significant changes, we found that place attachment is (seemingly) a necessary condition, rather than an inhibiting factor, for the effective implementation of climate change adaptation and peacebuilding interventions.

Mangrove farmers and representatives commented that young people are leaving the Bay. This lack of place attachment is a major limitation to climate adaptation and peacebuilding interventions because there are no participation and sustained action within the local community. Climate change adaptation organisations have been developing an education project known as "Mangrove Legacy" to prevent this. *"Many young people in the area no longer want to be there. They say, this is a very heavy job, very difficult, and we shouldn't be here. So, through education, we try to show them that it is important to stay in the territory"* (participant 2). However, there are two limitations to these place-based projects. First, people in the community may leave due to the absence of economic opportunities, even when feeling strongly attached to place. As one mangrove worker explained in the interview, *"In order to sustain the projects, it is necessary to improve the community's sources of income so that they do not have to leave"* (participant 15). Second, emotional and cultural attachment may prevent people from making changes, even if they are necessary to reduce impacts or prevent risks. Climate change adaptation and peacebuilding organisations need to consider these limitations to achieve shared goals, such as building resilience and peace.

5. Discussion

Climate change adaptation and peacebuilding share objectives and can create co-benefits through integrated approaches (Abrahams & Ober, 2024; Kurtz & Elsamahi, 2023; Morales-Muñoz, 2022). However, there are limitations for integrating these two areas, including siloed and clustered institutions, fragmented funding, and inadequate frameworks (Bergman, 2025; Ishiwatari, 2021; Vivekananda et al., 2014). The case of Cispatá Bay, Colombia is consistent with the literature about the overlaps, complementary effects and positive interactions between climate adaptation and peacebuilding (Hammill & Matthew, 2010; Ishiwatari, 2021; Matthew, 2014). The overlaps in capacity-building, particularly in employment, education, and environmental management, illustrate latent synergies between the two fields. However, these synergies are often underexplored due to capacity gaps, misaligned priorities and donor requirements. This can unintentionally reinforce vulnerabilities or even exacerbate local tensions (Bedoya Taborda et al., 2024; Ide, 2020).

In Cispatá Bay, Colombia, adaptation and peacebuilding interventions to provide employment and assets (such as fishing gear or livestock) have unintentionally reinforced cycles of dependence and economic instability. Interventions are usually short term and once they are completed, mangrove farmers are either unemployed or dependent on crops or farming activities no longer financed. These results are consistent with the "reinforcing feedback loops" and maladaptive governance risks described in the broader literature, where siloed programming and lack of conflict sensitivity undermine both peacebuilding and resilience outcomes (Abrahams, 2020; Swatuk et al., 2021).

To reduce reinforcing feedback loops climate adaptation interventions in Cispatá Bay are now including a "locally owned and conflict-sensitive" component. There are also efforts to establish a local coordination for environmental management interventions to provide long term economic support. These interventions constitute potential pathways to overcome some of the institutional and donor-related limitations noted in previous studies. This case study provides evidence of an evolving field in which local actors are trying to integrate climate adaptation and peacebuilding, and bridge the gaps identified in the literature. Based on these context-specific opportunities for synergies we developed a framework to integrate climate change adaptation and peacebuilding.

5.1. Integrating climate change adaptation and peacebuilding

Integrating adaptation and peacebuilding such as developing multi-scalar coordination, conflict-sensitive programming, and cross-sector policy guidelines can create tangible co-benefits in fragile and conflict-affected areas (Ishiwatari, 2021; Morales-Muñoz, 2022). However, there are some limitations for this integration including the lack of systematic and evidence-based frameworks (Bergman, 2025; Ishiwatari, 2021). To integrate adaptation and peacebuilding using an evidence-based framework we systematically analysed the overlaps, and gaps identified in the theory and the case study. This process involved mapping the capacities where climate change adaptation and peacebuilding overlapped, such as environmental management, education and social networks, the gaps or capacities present in one area but not in the other, and the capacities that would minimise limitations described by the participants. We then compared these overlaps and gaps with those found in the literature (see conceptual section), to understand whether and how the case study confirmed, complemented, or was different to the conceptual overlaps and gaps. Comparing and synthesising empirical results and theory, we consolidated the key capacities into an integrated framework. The resulting framework is therefore based on the capacities that would enable adaptation and peacebuilding to achieve more coherent and sustainable outcomes (see Fig. 5). While some capacities, such as social networks (often conceptualised in the literature as social capital or social construction processes), were anticipated based on the existing literature, others (e.g., education) were identified via participants' descriptions of what capacities were being built in practice, even when such capacities were not previously theorised as points of intersection in the adaptation-peacebuilding literature.

5.2. Determinants for capacity building in contexts of climate change and conflict

We identified eight determinants for capacity building in contexts affected by both climate change and conflict: (1) governance and institutions; (2) agency and cognitive processes; (3) employment and livelihood diversification; (4) technological and economic resources; (5) learning; (6) healing; (7) security and justice; and (8) social networks (see Fig. 5). These determinants, which underpin climate resilience and peace, are based on evidence from a climate and conflict-affected community. This helps identify what is most needed locally and what kinds of actions are likely to be most effective for advancing both climate

Fig. 5. A framework for building synergistic capacities in climate and conflict-affected communities. Developed by the systematic analysis of overlaps, gaps, and limitations identified in the case study and the existing literature, the framework synthesises key determinants for capacity building in regions affected by climate change and conflict.

adaptation and peacebuilding. However, further research in contexts of climate change and conflict is needed to be able to operationalise these determinants and define specific indicators and metrics. This would support the evaluation of ongoing interventions and the design of new ones in climate- and conflict-affected regions. For example, organisations working in coastal areas of Colombia or Central America could use the framework to assess whether their livelihood, conservation, and education interventions also address safety and trust-building, two areas often overlooked but essential for sustaining both peace and resilience.

5.2.1. *Governance and institutions*

In conflict-affected communities, governing institutions commonly lack the necessary political determination and/or capability to provide basic needs for poverty reduction, development, security, and human rights protection (Sitati et al., 2021). In Colombia, for example, the lack of state presence in distant or peripheral areas contributed to the emergence of armed groups that have led to forced displacement, loss of income, and land dispossession (Piccone, 2019). Communities living in these peripheral areas (characterised by a historical lack of state presence) may be forced to join armed groups, cultivate coca leaves, and illegally exploit natural resources because of the lack of economic options (Martinez & Vergara Tamayo, 2016; Morales-Muñoz, 2022). Increasing centralisation of authorities has also led to a reduced capacity and autonomy of authorities at the local level to implement effective climate change adaptation and peacebuilding interventions (Bencardino et al., 2019).

Building capacities for responsive, accountable, and inclusive institutions are needed for advancing both climate change adaptation and peacebuilding (Adano et al., 2012; Jones et al., 2017). These capacities include (a) organisational, institutional, and financial capacity to provide basic needs and (b) the ability to develop constructive and reinforcing relations with communities (Rodriguez Garavito et al., 2017). Such capacities are key to understanding and improving the structures and processes for decision-making, formulating policies, and managing resources at different levels (local, regional, national, or international) in the face of climate change and conflict (Jones et al., 2017).

5.2.2. *Agency and cognitive processes*

Agency and cognitive processes enable individuals and communities to decide whether to change and how to interpret and apply information within social-ecological contexts (Brown & Westaway, 2011). These processes are important because the way people understand and perceive climate change and conflict influences their willingness to act as well as their responses (Bandura, 2006; Mudombi et al., 2017). For example, conflict-affected communities with positive perceptions about the possibility of responding to difficult situations during violent conflict events are more likely to engage in peacebuilding interventions (Barnes et al., 2003). Building capacities for agency and cognitive processes involves developing individuals' abilities to act autonomously, make informed decisions, and understand and navigate social-ecological contexts effectively.

5.2.3. *Employment and livelihood diversification*

Employment and livelihood diversification include the actions or processes for expanding and varying income sources (Barnes et al., 2020; Kurtz & Elsamahi, 2023). This concept is often applied in the

context of rural or developing areas where communities traditionally rely on a single primary source of income, such as agriculture or cattle (Egorova & Hendrix, 2014). For instance, in Lake Chad, depending solely on cattle as a source of income has been found to increase pastoralists' vulnerability to income fluctuations resulting from livestock devaluation, disease, and conflict associated with climate-related droughts (Okpara et al., 2017). Building capacities for employment and livelihood diversification involves a strategic and continuing process to change the dependence on a single livelihood activity (e.g., through livelihood diversification, income subsidies, and social safety net provision) to reduce vulnerability to economic, environmental, and social shocks in fragile contexts (Egorova & Hendrix, 2014; Salehyan & Hendrix, 2014).

5.2.4. Technological and economic resources

Technological and economic resources commonly enable communities to adapt to the rapid effects of climate change and violent conflict (Ayana et al., 2016; Burrows & Kinney, 2016). Communities displaced by violent conflict may use financial assets (savings or credit) to find housing or cover immediate needs and joining or supporting an armed group may present itself as a viable response to economic problems (von Uexkull et al., 2020). Therefore, to reduce the opportunity cost, governments and organisations have implemented interventions to build technical and financial capacity in conflict-affected communities (Koubi, 2017; Vestby, 2019). However, when implementing interventions to provide assets, the broader social context must be considered.

Interventions to reduce food insecurity through asset provision (e.g., food aid) have inadvertently undermined long-term resilience by creating dependency on crops (e.g., rice) in mountainous regions with insufficient water or forcing communities to monoculture (e.g., in Rwanda) (Shimada, 2022; Vivekananda et al., 2014). These reinforcing feedback or boomerang effects represent a promising area of research because they likely influence the effectiveness and outcomes of adaptation and peacebuilding. Exploring this feedback might provide valuable insights into designing and implementing interventions that effectively and simultaneously build resilience and peace.

5.2.5. Learning

Learning is the ability to recognise change, determine the causes of change, and consider appropriate responses (Cinner & Barnes, 2019). Building capacities for learning is not only about education or access to information, but also about processes to understand complex interactions and problems. In conflict settings, learning can contribute to building awareness of the compound relationship between climate change and violent conflict. Displaced communities in conflict settings are required to learn about other practices and livelihoods in other locations and sometimes learn new ways of making a living. Building capacities for learning in these contexts enables communities and individuals to frame cumulative and interactive problems to effectively adapt and respond to co-occurring shocks (Fazey et al., 2007).

5.2.6. Healing

Armed conflict has severe psychological and social impacts associated with trauma, loss, uprooting, and the disruption of ways of living (Tamayo-Agudelo & Bell, 2019). Climate change also has different effects on human well-being (Adger et al., 2022; Fritsche et al., 2012; Hayward & Ayeb-Karlsson, 2021). Climate adaptation literature recognises three effects: first, changes in the material conditions (i.e. infrastructure and ecosystems) in which communities live; second, impacts on communities' aspirations, hopes, and fears as it imposes significant, complex, and unforeseeable changes; and third effects on economic wellbeing because of policy responses to climate change (e.g., taxation or limited access to public services) (Adger et al., 2022). These effects can occur after or even before an extreme event and should be considered in climate adaptation. Access to mental health support, social networks, and healing practices help communities to process loss, regain stability, and build resilience, but they are a long and culturally specific process. While political processes for healing, reconciliation and well-being are important in ending cycles of violence and recovering from distress, it is commonly an individual and subjective experience that needs to be part of wider reconstruction efforts (Barnes et al., 2003). For example, conflict-affected communities involved in national reconciliation processes may still perceive there were no collective memory exercises for commemoration of the victims' suffering and decide they will not support these processes (Londoño et al., 2024). Healing needs to be sought at the individual level yet dependent upon and interrelated with the social-ecological context, including climate change impacts.

5.2.7. Security and justice

Conflict-affected communities are vulnerable to inadequate law enforcement, insecurity, marginalisation and injustice (Sitati et al., 2021). These issues are often intensified by limited public trust in governing authorities and insufficient technical and financial capacity to address these issues (Walch, 2018). The United Nations Security Council has long emphasised the critical need for institutional reforms in conflict-affected communities. These reforms include policies and interventions to re-establishing the prison system, investigating human rights and humanitarian law violations, and reforming or restructuring the police, military, and judicial systems (Office of the United Nations High Commissioner for Human Rights, 2006). Such institutional reforms contribute to reducing the levels of conflict and building adaptive capacities for climate change. Climate change impacts often exacerbate security and justice issues by limiting marginalised groups' access to key resources such as land and water (Intergovernmental Panel on Climate Change, 2022). Without secure access to resources and equitable enforcement of laws, communities are more likely to experience social unrest, conflicts, and increased vulnerabilities to climate impacts (Walch, 2018). Interventions to provide security and access to justice are necessary for building peace but also climate change resilience.

5.2.8. Social networks

Formal and informal relationships between individuals, communities, and/or institutions are factors that enable or inhibit adaptive responses (Burrows & Kinney, 2016; Chandra et al., 2017; Okpara et al., 2017; Peñalba et al., 2012; von Uexkull, 2014). Intergroup relationships in conflict-affected communities can support perceptions of physical security, and cooperation (Fritsche et al., 2012; Grady et al., 2023). Moreover, resource-dependent communities have been found to be less likely to engage in conflicts over resources when they participate in cooperatives that promote shared access to resources or equitable distribution of profits (Burden & Rod, 2019; Schott et al., 2007).

Governing authorities, community-based organisations, and individuals can build social relationships by creating opportunities for sustained interaction in different spaces (e.g., communal events or planning and decision-making spaces) (Barnes et al., 2020). These spaces are important to facilitate access to information on the immediate needs arising from climate change and conflict and to increase the effectiveness of interventions or responses (Morales-Muñoz, 2022).

5.3. Breaking the silos: Collaborative networks and cross-sectoral coordination

Climate change adaptation and peacebuilding interventions are implemented in general by different governing authorities and institutions that function "as a set of independent, interacting actors" —a phenomenon known as polycentric governance (Morrison, 2017). We found that in Cispatá Bay, Colombia, these complex networks between governing authorities and other institutions organise their relationships through 'connectors or brokers' (see Fig. 6). The connectors or brokers are central within the network of others working in the same area or sector as them (i.e., climate change adaptation or peacebuilding) but to

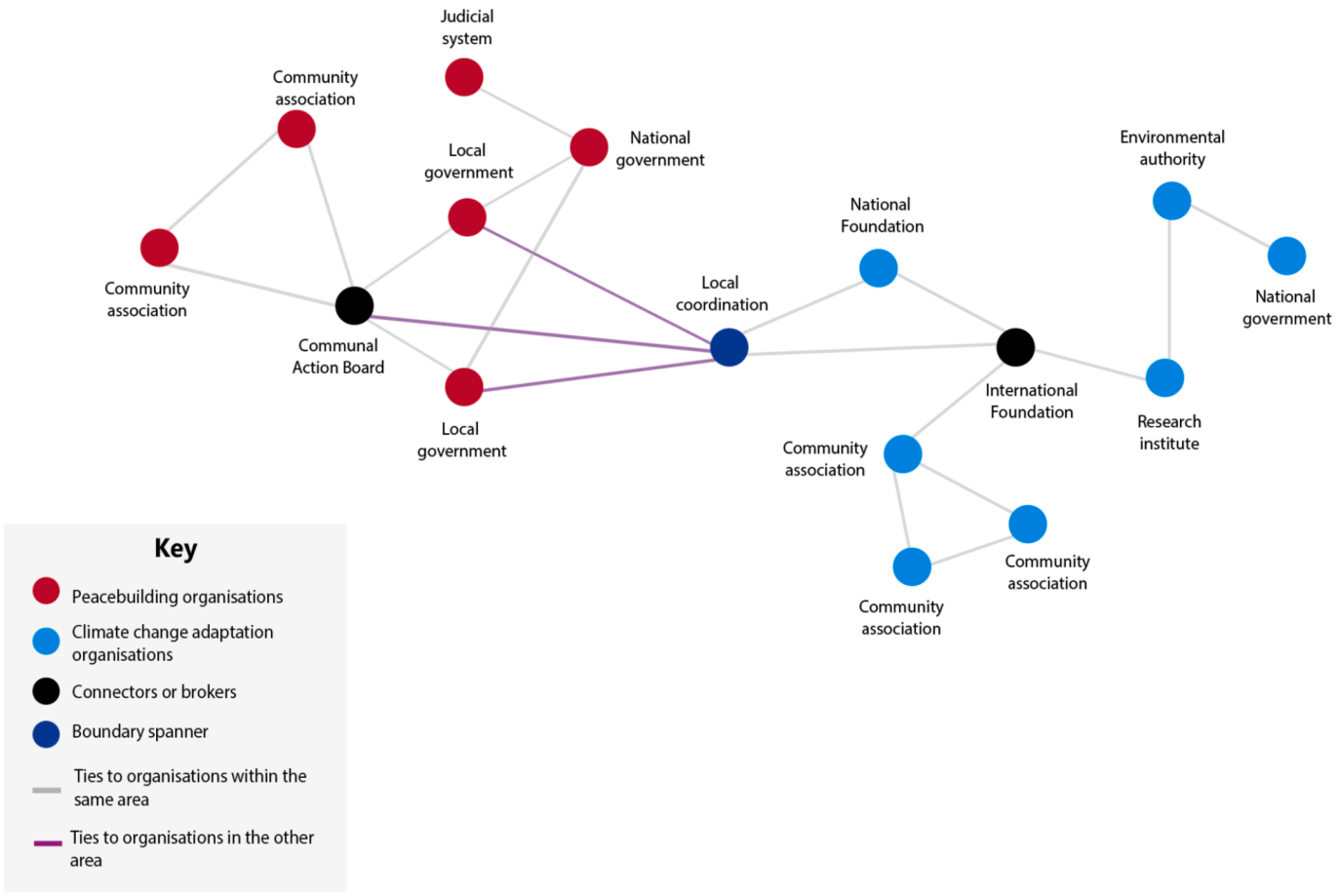


Fig. 6. Climate change adaptation and peacebuilding networks in Cispatá Bay, Colombia. The sociogram represents the independent relationships between climate change adaptation organisations (nodes in blue) and peacebuilding organisations (nodes in red) in Cispatá Bay, Colombia. These organisations (nodes) function as a set of separate, interacting actors. There are two "connectors" (nodes in black) that leverage the network, and there is one *Local Coordination group* that crosses organisational boundaries, i.e., a 'boundary spanner', and mediates interactions between climate change adaptation and peacebuilding to facilitate communication, collaboration, and knowledge sharing (node in dark blue). The grey lines in the figure represent the ties to other organisations within the same area and the purple ones to organisations in the other area. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

promote cross-sectoral coordination (Abdi et al., 2023; Barnett, 2019; Eklöw & Krampe, 2019), one of the climate change adaptation organisations created a *Local Coordination group*. This instance concentrates the adaptation efforts to reach all people needing assistance. In doing so, the *Local Coordination group* serves as a boundary spanner (Long et al., 2013) that brings together diverse climate change adaptation and peacebuilding actors in the Bay.

During the interviews some participants said that this *Local Coordination group* has helped forced displaced fishers and farmers in finding other ways to making a living or cover immediate needs when there is not a formal peacebuilding intervention (participants 5, 9 and 10). This suggests that social networks between climate change adaptation and peacebuilding organisations represent a promising way to increase cooperation and synergies, which could potentially be further enhanced by establishing local network connections or a coordination centre that acts as a boundary spanner. A boundary spanner would facilitate communication, collaboration, and knowledge sharing between different organisations, breaking the 'silos' to integrate climate change adaptation and peacebuilding (Cash & Moser, 2000; Ehler et al., 1997; Kenchington, 2018; Lee et al., 2014; Lorenzoni et al., 2007). In the Arctic region, social networks between local communities, shared norms and knowledge, help to explain the absence of violent interstate conflict (Crawford, 2021).

In situations of fragility and conflict, local actions and interventions need coordination and support to respond to combined and overlapping problems (Ngaruiya, 2014). We propose that the establishment of a network of overlapping local, regional, and national organisations and coordination centres could break down the silos towards integrated implementation of climate change adaptation and peacebuilding interventions. Future research could interrogate how such networks would function and could be sustained.

6. Conclusions

Climate change adaptation and peacebuilding aim to bring about changes in social, economic, environmental, and institutional contexts to build resilience and support communities' ability to respond to impacts. Given these aims, it is perhaps not surprising that we found that climate change adaptation and peacebuilding overlap in many of their goals and activities. In practice, however, interventions focused on building capacities to adapt to climate change and respond to conflict are not integrated and their efforts are often duplicated, which may result in missed opportunities to increase the efficiency and effectiveness of climate change and peacebuilding and at worst create boomerang effects or maladaptive outcomes, whereby adaptation and peacebuilding interventions increase or redistribute communities' vulnerabilities. Using an in-depth case study of Cispatá Bay, located in the Caribbean Sea, Colombia, in South America and two data collection methods (interviews and document analysis), we found six major areas of overlap between climate change adaptation and peacebuilding: access

to information, education, social networks, employment, environment, and healing. We also found two gaps: protection and/or safety and socio-cognitive constructs, which could undermine both climate change adaptation and peacebuilding.

Synthesizing our findings on these overlaps and gaps with the existing literature and empirical evidence on climate adaptation and peacebuilding, we proposed an evidence-based framework centred on building synergistic capacities in climate and conflict-affected communities. We identify eight major elements that can help build both climate resilience and peace: Governance and institutions; Agency and cognitive processes; Employment and livelihoods diversification; Technological and economic resources; Learning; Healing; Security and justice; and Social networks. These elements provide an important path forward for translating conceptualisations of the climate-conflict relationship into policy and planning. Drawing on results from our in-depth case study in Cispata Bay, Colombia, we also provide an initial roadmap for how collaborative networks between climate adaptation and peacebuilding organisations might enable integration across the climate-conflict nexus. As the world continues to move toward an uncertain climate future, practitioners and policymakers must urgently adopt such cross-sector approaches to effectively respond to the cumulative impacts of climate change and conflict.

CRediT authorship contribution statement

Luisa Fernanda Bedoya Taborda: Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tiffany H. Morrison:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Michele L. Barnes:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors acknowledge INVEMAR Research Institute, Conservation International, Omacha Foundation, Vida Manglar, Ministry of Environment and Sustainable Development of Colombia, Fund Colombia in Peace, Land Restitution Unit, Victims Unit, and Colombian Environmental Authorities for their support in the study of climate change adaptation and peacebuilding in Colombia. They also acknowledge mangrove farmers, associations, fishers, and local communities of Cispatá Bay, whose invaluable contributions made this work possible.

Funding

LBT was supported by the Australian Research Council Centre of Excellence for Coral Reef Studies (# CE140100020), the College of Arts, Society, and Education at James Cook University (JCU Higher Degree by Research Scholarship) and the Faculty of Engineering at The University of Sydney (Faculty of Engineering Research Stipend Scholarship). T.H. M. was supported by the Australian Research Council through the Australian Research Council Discovery Program (# DP220103921). MB was supported by the Australian Research Council through a Discovery Early Career Fellowship Grant (#DE190101583) and the Centre of Excellence Program (# CE140100020).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloenvcha.2026.103151.

Data availability

The data that has been used is confidential.

References

Abdi, A.H., Mohamed, A.A., Sugow, M.O., 2023. Exploring the effects of climate change and government stability on internal conflicts: evidence from selected sub-Saharan african countries [Article]. Environ. Sci. Pollut. Res. Int. 30 (56), 118468–118482. https://doi.org/10.1007/s11356-023-30574-w.

Abrahams, D., 2020. Conflict in abundance and peacebuilding in scarcity: challenges and opportunities in addressing climate change and conflict. World Dev. 132, 104998. https://doi.org/10.1016/j.worlddev.2020.104998.

Abrahams, D., 2021. Land is now the biggest gun: climate change and conflict in Karamoja, Uganda [Article]. Clim. Dev. 13 (8), 748–760. https://doi.org/10.1080/17565529.2020.1862740.

Abrahams, D., Carr, E.R., 2017. Understanding the connections between climate change and conflict: contributions from geography and political ecology. Current Climate Change Rep. 3 (4), 233–242. https://doi.org/10.1007/s40641-017-0080-z.

Abrahams, D., Ober, K., 2024. Conflict mitigation as a means of climate change adaptation: Lessons for policy and development practice. Environ. Secur. 2 (2), 277–290. https://doi.org/10.1177/27538796241246409.

Adano, W.R., Dietz, T., Witsenburg, K., Zaal, F., 2012. Climate change, violent conflict and local institutions in kenya's drylands [Article]. J. Peace Res. 49 (1), 65–80. https://doi.org/10.1177/0022343311427344.

Adger, W., Barnett, J., Heath, S., Jarillo, S., 2022. Climate change affects multiple dimensions of well-being through impacts, information and policy responses. Nat. Hum. Behav. 6, 1–9. https://doi.org/10.1038/s41562-022-01467-8.

Adger, W.N., 2003. Social capital, collective action, and adaptation to climate change. Econ. Geogr 79 (4), 387–404. https://doi.org/10.1111/j.1944-8287.2003.tb00220.x.

Adger, W. N., Pulhin, J. M., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., Spring, Ú. O., Vogel, C. H., Adams, H., Hodbod, J., Kent, S., & Tarazona, M. (2014). *Human Security* (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 Issue. https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap12_FINAL.pdf.

Alkire, S., 2005. Subjective quantitative studies of human agency. Soc. Indic. Res. 74 (1), 217–260. https://doi.org/10.1007/s11205-005-6525-0.

Ayana, E.K., Ceccato, P., Fisher, J.R.B., DeFries, R., 2016. Examining the relationship between environmental factors and conflict in pastoralist areas of East Africa [Article]. Sci. Total Environ. 557–558, 601–611. https://doi.org/10.1016/j.scitotenv.2016.03.102.

Bandura, A., 2006. Toward a psychology of human agency. Perspect. Psychol. Sci. 1 (2), 164–180. https://doi.org/10.1111/j.1745-6916.2006.00011.x.

Barnes, M.L., Wang, P., Cinner, J.E., Graham, N.A.J., Guerrero, A.M., Jasny, L., Lau, J., Sutcliffe, S.R., Zamborain-Mason, J., 2020. Social determinants of adaptive and transformative responses to climate change. Nat. Clim. Chang. 10 (9), 823–828. https://doi.org/10.1038/s41558-020-0871-4.

Barnes, T., Bloomfield, D., Huyse, L., 2003. *Reconciliation after violent conflict : a handbook*. IDEA Stockholm.

Barnett, J., 2019. Global environmental change I: climate resilient peace? Prog. Hum. Geogr. 43 (5), 927–936. https://doi.org/10.1177/0309132518798077.

Barnett, J., O'Neill, S., 2010. Maladaptation [Editorial]. Glob. Environ. Chang. 20 (2), 211–213. https://doi.org/10.1016/j.gloenvcha.2009.11.004.

Barnett, M., Kim, H., O'Donnell, M., Sitea, L., 2007. Peacebuilding: what is in a name? Glob. Gov. 13 (1), 35–58. http://www.jstor.org/stable/27800641.

Bedoya Taborda, L. F., Barnes, Michele L., & Morrison, Tiffany H. (2024). Adaptation and Peace: Extending the Agenda for Capacity-Building in Climate and Conflict-Affected Communities. *WIREs Climate Change*, *n/a*(n/a), e921. 10.1002/wcc.921.

Bencardino, J. A., Escobar, D. A. O., & Albarracín, A. G. (2019). The reversal of the decentralization process in Colombia The peace agreement with Farc as an opportunity to re-decentralize the country. *Verfassung und Recht in Übersee / Law and Politics in Africa, Asia and Latin America*, *52*(1), 51-66. https://www.jstor.org/stable/26783329.

Bergman, J., 2025. Climate change adaptation in fragile and conflict-affected settings: conflict and peace considerations in project design. Environ. Secur. 3 (3), 299–318. https://doi.org/10.1177/27538796251315292.

Boyatzis, R.E., 1998. *Transforming Qualitative Information: Thematic Analysis and Code Development*. Sage Publications Inc.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101. https://doi.org/10.1191/1478088706qp063oa.

Brown, K., Westaway, E., 2011. Agency, capacity, and resilience to environmental change: lessons from human development, well-being, and disasters. Annu. Rev. Env. Resour. 36 (1), 321–342. https://doi.org/10.1146/annurev-environ-052610-092905.

Buhaug, H. (2010). Climate not to blame for African civil wars. *Proceedings of the National Academy of Sciences - PNAS*, *107*(38), 16477-16482. https://doi.org/10.1073/pnas.1005739107.

Buhaug, H., von Uexkull, N., 2021. Vicious circles: violence, vulnerability, and climate change. Annu. Rev. Env. Resour. 46 (1), 545–568. https://doi.org/10.1146/annurev-environ-012220-014708.

Burden, M., Rod, F., 2019. Better fisheries management can help reduce conflict, improve food security, and increase economic productivity in the face of climate change. Mar. Policy 108, 103610. https://doi.org/10.1016/j.marpol.2019.103610.

Burrows, K., Kinney, P.L., 2016. Exploring the climate change, migration and conflict nexus [Review]. Int. J. Environ. Res. Public Health 13 (4), 443. https://doi.org/10.3390/ijerph13040443, 17.

Busby, J., Smith, T., White, K., Strange, S., 2013. Climate change and insecurity: mapping vulnerability in Africa. Int. Secur. 37, 132–172. https://doi.org/10.1162/ISEC_a_00116.

Busby, J., Smith, T.G., Krishnan, N., Wight, C., Vallejo-Gutierrez, S., 2018. In harm's way: climate security vulnerability in Asia [Article]. World Dev. 112, 88–118. https://doi.org/10.1016/j.worlddev.2018.07.007.

Cantillo, T., Garza, N., 2022. Armed conflict, institutions and deforestation: a dynamic spatiotemporal analysis of Colombia 2000-2018. World Dev. 160, 106041. https://doi.org/10.1016/j.worlddev.2022.106041.

Cash, D.W., Moser, S.C., 2000. Linking global and local scales: designing dynamic assessment and management processes. Glob. Environ. Chang. 10 (2), 109–120. https://doi.org/10.1016/S0959-3780(00)00017-0.

Chandra, A., Dargusch, P., McNamara, K.E., Caspe, A.M., Dalabajan, D., 2017. A study of climate-smart farming practices and climate-resiliency field schools in Mindanao, the Philippines. World Dev. 98, 214–230. https://doi.org/10.1016/j.worlddev.2017.04.028.

Chetail, V. J., Oliver C. (2015). *Peacebuilding: a review of the academic literature*. https://repository.graduateinstitute.ch/record/293412?v=pdf.

Choudhury, M.-U.-I., Haque, C.E., 2016. "We are more scared of the power elites than the floods": Adaptive capacity and resilience of wetland community to flash flood disasters in Bangladesh. Int. J. Disaster Risk Reduct. 19, 145–158. https://doi.org/10.1016/j.ijdrr.2016.08.004.

Cinner, J.E., Adger, W.N., Allison, E.H., Barnes, M.L., Brown, K., Cohen, P.J., Gelcich, S., Hicks, C.C., Hughes, T.P., Lau, J., Marshall, N.A., Morrison, T.H., 2018. Building adaptive capacity to climate change in tropical coastal communities. Nat. Clim. Chang. 8 (2), 117–123. https://doi.org/10.1038/s41558-017-0065-x.

Cinner, J.E., Barnes, M.L., 2019. Social Dimensions of Resilience in Social-Ecological Systems. One Earth 1 (1), 51–56. https://doi.org/10.1016/j.oneear.2019.08.003.

Coning, C.D., 2008. Understanding peacebuilding : consolidating the peace process. Conflict Trends 2008 (4), 45–51. https://doi.org/10.10520/EJC16026.

Conservation International. (2021). *Vida Manglar Impact Report* https://www.conservation.org/docs/default-source/publication-pdfs/cispata-bay-mangroves-2022-impact-report.pdf?sfvrsn=2b5b6f4d_3.

Coulthard, S., 2012. Can we be both resilient and well, and what choices do people have? incorporating agency into the resilience debate from a fisheries perspective. Ecol. Soc. 17 (1). http://www.jstor.org/stable/26269013.

Crawford, B.K., 2021. Explaining Arctic peace: a human heritage perspective [Article]. Int. Rel. 35 (3), 469–488. https://doi.org/10.1177/00471178211036782.

Egorova, A., & Hendrix, C. (2014). *Can natural disasters precipitate peace?* (Research Brief August 2014, Issue. https://reliefweb.int/report/world/can-natural-disasters-precipitate-peace-research-brief-august-2014.

Ehler, C.N., Cicin-Sain, B., Knecht, R., South, R., Weiher, R., 1997. Guidelines to assist policy makers and managers of coastal areas in the integration of coastal management programs and national climate-change action plans. Ocean Coastal Manage. 37 (1), 7–27. https://doi.org/10.1016/S0964-5691(97)00049-5.

Eklöw, K., & Krampe, F. (2019). *Climate-related security risks and peacebuilding in Somalia* (SIPRI Policy Paper No. 53, Issue. https://www.sipri.org/publications/2019/sipri-policy-papers/climate-related-security-risks-and-peacebuilding-somalia.

Fazey, I., Fazey, J.A., Fischer, J., Sherren, K., Warren, J., Noss, R.F., Dovers, S.R., 2007. Adaptive capacity and learning to learn as leverage for social–ecological resilience. Front. Ecol. Environ. 5 (7), 375–380. https://doi.org/10.1890/1540-9295(2007)5[375:ACALTL]2.0.CO;2.

Feola, G., Agudelo Vanegas, L.A., Contesse Bamón, B.P., 2015. Colombian agriculture under multiple exposures: a review and research agenda [Review]. Clim. Dev. 7 (3), 278–292. https://doi.org/10.1080/17565529.2014.934776.

Fereday, J., Muir-Cochrane, E., 2006. Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development. Int. J. Qual. Methods 5 (1), 80–92. https://doi.org/10.1177/160940690600500107.

Fernández Arribas, G. (2023). Cambio climático, inestabilidad y desplazamientos en el Sahel. Desafíos y respuesta por parte de la Unión Europea [Climate change, instability and displacement in the Sahel. Challenges and the EU response.]. *Revista Española de Derecho Internacional*, *75*(1). https://www.revista-redi.es/redi/article/view/63.

Fondo Colombia en Paz. (2023). *Colombia sostenible y en paz*. https://www.colombiasostenible.gov.co/programa/2023/05/23/colombia-sostenible-y-en-paz/.

Foundation Ideas for Peace. (2019). The economic reintegration of former FARC combatants. Future challenges and risks. https://multimedia.ideaspaz.org/media/website/FIP_NE_Reincorporacion.pdf.

Fritsche, I., Cohrs, J.C., Kessler, T., Bauer, J., 2012. Global warming is breeding social conflict: the subtle impact of climate change threat on authoritarian tendencies. J. Environ. Psychol. 32 (1), 1–10. https://doi.org/10.1016/j.jenvp.2011.10.002.

Grady, C., Wolfe, R., Dawop, D., Inks, L., 2023. How contact can promote societal change amid conflict: an intergroup contact field experiment in Nigeria. Proc. Natl. Acad. Sci. 120 (43). https://doi.org/10.1073/pnas.2304882120 e2304882120.

Grothmann, T., Patt, A., 2005. Adaptive capacity and human cognition: the process of individual adaptation to climate change. Glob. Environ. Chang. 15 (3), 199–213. https://doi.org/10.1016/j.gloenvcha.2005.01.002.

Hammill, A., Matthew, R., 2010. Peacebuilding and climate change adaptation. St Antony's International Review 5 (2), 89–112. http://www.jstor.org/stable/26227055.

Hayward, G., Ayeb-Karlsson, S., 2021. 'Seeing with empty eyes': a systems approach to understand climate change and mental health in Bangladesh [Article]. Clim. Change 165 (1–2), 29. https://doi.org/10.1007/s10584-021-03053-9, 30.

Hendrix, C.S., Glaser, S.M., Lambert, J.E., Roberts, P.M., 2022. Global climate, El Niño, and militarized fisheries disputes in the East and South China Seas [Article; Early Access]. Mar. Policy 143 (6), 105137. https://doi.org/10.1016/j.marpol.2022.105137.

Herrera Carmona, J. C., Prüssmann Uribe, J., Abud Hoyos, M., & Zapata Padilla, L. A. (2024). Vulnerability and climate risk analysis of the mangrove socio-ecosystem in Colombia. *Boletín de Investigaciones Marinas y Costeras - INVEMAR*, *53*, 103-132. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0122-97612024000200103&nrm=iso.

Hinkel, J., 2011. "Indicators of vulnerability and adaptive capacity": Towards a clarification of the science–policy interface. Glob. Environ. Chang. 21 (1), 198–208. https://doi.org/10.1016/j.gloenvcha.2010.08.002.

Hoch, J.M., de Bruin, S.P., Buhaug, H., Von Uexkull, N., van Beek, R., Wanders, N., 2021. Projecting armed conflict risk in Africa towards 2050 along the SSP-RCP scenarios: a machine learning approach [Article]. Environ. Res. Lett. 16 (12), 124068. https://doi.org/10.1088/1748-9326/ac3db2, 21.

Hyde, K.F., 2000. Recognising deductive processes in qualitative research. Qual. Mark. Res. Int. J. 3 (2), 82–90. https://doi.org/10.1108/13522750010322089.

Ide, T., 2020. The dark side of environmental peacebuilding. World Dev. 127, 104777. https://doi.org/10.1016/j.worlddev.2019.104777.

Ide, T. (2021). *La construccion de la paz ambiental*. https://www.instituto-capaz.org/wp-content/uploads/2021/03/DT-1-2021espanol-v6.pdf.

Ide, T. (2023). Climate, Women, and Conflict: Rebel Groups' Armed Activities after Major Disasters [Article]. *Global Studies Quarterly*, *3*(3), Article ksad039. https://doi.org/10.1093/isagsq/ksad039.

Ide, T., Johnson, M.F., Barnett, J., Krampe, F., Le Billon, P., Maertens, L., von Uexkull, N., Vélez-Torres, I., 2023. The future of environmental peace and conflict research. Environ. Politics 32 (6), 1077–1103. https://doi.org/10.1080/09644016.2022.2156174.

Intergovernmental Panel on Climate Change. (2018). Annex I: Glossary In J. B. R. Matthews (Ed.), *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global resonse to the threat of climate change, sustainable development, and efforts to eradicate poverty* (pp. 541-562). https://doi.org/10.1017/9781009157940.008.

Intergovernmental Panel on Climate Change. (2022). *Summary for Policymakers* [Report] (Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Issue. https://www.ipcc.ch/report/ar6/wg2/.

Ishiwatari, M. (2021). Regional Policies and Initiatives on Climate Change and Disaster Risks: How Can Peacebuilding Assistance and Climate Change Adaptation Be Integrated? In (pp. 333-343). https://doi.org/10.1007/978-981-15-8852-5_16.

Jones, B.T., Mattiacci, E., Braumoeller, B.F., 2017. Food scarcity and state vulnerability: Unpacking the link between climate variability and violent unrest [Article]. J. Peace Res. 54 (3), 335–350. https://doi.org/10.1177/0022343316684662.

Juhola, S., Glaas, E., Linnér, B.-O., Neset, T.-S., 2016. Redefining maladaptation. Environ. Sci. Policy 55, 135–140. https://doi.org/10.1016/j.envsci.2015.09.014.

Kenchington, R., 2018. Science and the management of coral reefs. Mar. Pollut. Bull. 136, 508–515. https://doi.org/10.1016/j.marpolbul.2018.09.046.

Koubi, V., 2017. Climate Change, the Economy, and Conflict [Review]. Curr. Clim. Change Rep. 3 (4), 200–209. https://doi.org/10.1007/s40641-017-0074-x.

Kurtz, J., Elsamahi, M., 2023. How can peacebuilding contribute to climate resilience? evidence from the drylands of East and West Africa [Review]. Curr. Opin. Environ. Sustain. 63, 101315. https://doi.org/10.1016/j.cosust.2023.101315.

Lee, E., Su Jung, C., Lee, M.-K., 2014. The potential role of boundary organizations in the climate regime. Environ. Sci. Policy 36, 24–36. https://doi.org/10.1016/j.envsci.2013.07.008.

Londoño, P., Monsalve, L., Trujillo, S., 2024. The significance of prior resilience experiences in communities exposed to socio-political violence in Colombia for enhancing the community-based disaster management (CBDM) model. J. Infrastructure, Policy Develop. 8, 5352. https://doi.org/10.24294/jipd.v8i9.5352.

Long, J.C., Cunningham, F.C., Braithwaite, J., 2013. Bridges, brokers and boundary spanners in collaborative networks: a systematic review. BMC Health Serv. Res. 13 (1), 158. https://doi.org/10.1186/1472-6963-13-158.

Lorenzoni, I., Jones, M., Turnpenny, J.R., 2007. Climate change, human genetics, and post-normality in the UK. Futures 39 (1), 65–82. https://doi.org/10.1016/j.futures.2006.03.005.

Mach, K. J. K., Caroline M.; Adger, W. Neil; Buhaug, Halvard; Burke, Marshall; Fearon, James D.; Field, Christopher B.; Hendrix, Cullen S.; Maystadt, Jean-Francois; O'Loughlin, John; Roessler, Philip; Scheffran, Jürgen; Schultz, Kenneth A.; von Uexkull, Nina. (2019). Climate as a risk factor for armed conflict. *Nature (London)*, *571*(7764), 193-197. https://doi.org/10.1038/s41586-019-1300-6.

Marine and Coastal Research Institute INVEMAR. (2010). *Diagnosis of erosion in the coastal zone of the Colombian Caribbean* https://www.invemar.org.co/redcostera1/invemar/docs/606320080501_EErosionCaribeContinetalColombia.pdf.

Martinez, J.N., Vergara Tamayo, C.A., 2016. Conflicto armado, posconflicto con las FARC-EP y medio ambiente en Colombia. Una mirada coyuntural del departamento

de Putumayo [Armed conflict, post-conflict with the FARC-EP and the environment in Colombia. a conjunctural view of the department of Putumayo.]. Rev. Criterios Facultad Ciencias Econ. https://revistas.unimilitar.edu.co/index.php/CREFCE/article/view/3270/2840.

Matthew, R., 2014. Integrating climate change into peacebuilding [Article]. Clim. Change 123 (1), 83–93. https://doi.org/10.1007/s10584-013-0894-1.

Ministry of Environment and Sustainable Development. (2017). *Management Report to Congress.* https://www.minambiente.gov.co/wp-content/uploads/2021/10/INFORME_GESTION_AL_CONGRESO_2016_-_2017_MINAMBIENTE.pdf.

Ministry of Environment and Sustainable Development. (2021). *Vida Manglar, el proyecto que el ministro Correa lanzó en Monaco Ocean Week* https://archivo.minambiente.gov.co/index.php/noticias-minambiente/5008-vida-manglar-el-proyecto-que-el-ministro-correa-lanzo-en-monaco-ocean-week.

Ministry of Environment and Sustainable Development, & United Nations Development Program and Ministry of Foreign Affairs of Colombia. (2019). *Sixth report of Colombia to the Convention on Biological Diversity*. https://www.cbd.int/doc/nr/nr-06/co-nr-06-es.pdf.

Mobaied, S., Rudant, J.P., 2019. New method for environmental monitoring in armed conflict zones: a case study of Syria [Article]. Environ. Monit. Assess. 191 (11), 643. https://doi.org/10.1007/s10661-019-7805-5, 10.

Morales-Muñoz, H. (2022). Revision de la literatura sobre la seguridad climatica y la consolidacion de la paz ambiental: riesgos y oportunidades en la region Andina. https://www.ssrc.org/wp-content/uploads/2022/10/Revision-de-Literatura-Seguridad-Climatica-Region-Andina-f.pdf.

Morrison, T.H., 2017. Evolving polycentric governance of the Great Barrier Reef. Proc. Natl. Acad. Sci. 114 (15), E3013–E3021. https://doi.org/10.1073/pnas.1620830114.

Mortreux, C., Barnett, J., 2017. Adaptive capacity: exploring the research frontier. WIREs Clim. Change 8 (4), e467. https://doi.org/10.1002/wcc.467.

Mudombi, S., Fabricius, C., van Zyl-Bulitta, V., Patt, A., 2017. The use of and obstacles to social learning in climate change adaptation initiatives in South Africa. Jamba 9 (1), 292. https://doi.org/10.4102/jamba.v9i1.292.

Ngaruiya, G., 2014. Does Reactive adaptation exist? using the ecosystem service governance approach to evaluate post-drought rural food security in Kenya. Nat. Resour. 05, 392–407. https://doi.org/10.4236/nr.2014.58037.

O'Brien, K., Sygna, L., Leichenko, R., Adger, W. N., Barnett, J., Mitchell, T., Schipper, L., Tanner, T., Vogel, C., & Mortreux, C. (2008). *Disaster risk reduction, climate change adaptation and human security* (GECHS Report 2008:3, Issue. https://www.preventionweb.net/files/7946_GECHSReport3081.pdf.

Office of the United Nations High Commissioner for Human Rights. (2006). *Rule of law tools for post-conflict states. Mapping the justice system.* https://www.ohchr.org/sites/default/files/Documents/Publications/RuleoflawMappingen.pdf.

Okpara, U.T., Stringer, L.C., Dougill, A.J., 2017. Using a novel climate-water conflict vulnerability index to capture double exposures in Lake Chad. Reg. Environ. Chang. 17 (2), 351–366. https://doi.org/10.1007/s10113-016-1003-6.

Omacha Foundation. (2022). *Program Vida Manglar* https://omacha.org/programa-vida-manglar/.

Organisation for Economic Cooperation and Development. (2008). *Evaluating conflict prevention and peacebuilding activities* https://www.oecd.org/development/evaluation/dcdndep/39289596.pdf.

Pelling, M., High, C., 2005. Understanding adaptation: what can social capital offer assessments of adaptive capacity? Glob. Environ. Chang. 15 (4), 308–319. https://doi.org/10.1016/j.gloenvcha.2005.02.001.

Peñalba, L.M., Elazegui, D.D., Pulhin, J.M., Victor, O., Cruz, R., 2012. Social and institutional dimensions of climate change adaptation. Int. J. Clim. Change Strategies Manage. 4 (3), 308–322. https://doi.org/10.1108/17568691211248748.

Pérez Marulanda, L., & Castro, A. (2022). Marco conceptual para medir las contribuciones de las intervenciones en agricultura para mitigar el cambio climático y construir paz. https://cgspace.cgiar.org/items/7f37de9e-2323-4e6c-944a-7c29517189fd.

Pérez-Rincón, M., Peralta-Ardila, M.D., Vélez-Torres, I., Méndez, F., 2022. Internal armed conflict and environment in Colombia: analysis from ecological conflicts, 1960-2016. J. Political Ecol. 29, 672–703.

Pernetta, J.C., 1992. Impacts of climate change and sea-level rise on small island states: National and international responses. Glob. Environ. Chang. 2 (1), 19–31. https://doi.org/10.1016/0959-3780(92)90033-4.

Piccone, T. (2019). *Peace with justice: the colombian experience with transitional justice* https://www.brookings.edu/wp-content/uploads/2019/06/fp_20190708_colombia.pdf.

Raleigh, C., Urdal, H., 2007. Climate change, environmental degradation and armed conflict [Article]. Polit. Geogr. 26 (6), 674–694. https://doi.org/10.1016/j.polgeo.2007.06.005.

Rangel-Buitrago, N.G., Anfuso, G., Williams, A.T., 2015. Coastal erosion along the Caribbean coast of Colombia: Magnitudes, causes and management. Ocean Coastal Manage. 114, 129–144. https://doi.org/10.1016/j.ocecoaman.2015.06.024.

Regional Autonomous Corporation of the Sinú and San Jorge Valleys CVS, & Marine and Coastal Research Institute INVEMAR. (2010). *Integral Management Plan DMI Cispatá-La Balsa-Tinajones and surrounding areas.* http://www.invemar.org.co/redcostera1/invemar/docs/11028PIM_Cispata.pdf.

Rodriguez Garavito, C., Rodriguez Franco, D., & Duran Crane, H. (2017). *La paz ambiental Retos y propuestas para el posacuerdo* [Environmental peace. Challenges and proposals for the post-agreement period]. https://www.dejusticia.org/wp-content/uploads/2017/04/fi_name_recurso_924.pdf.

Rural Agricultural Planning Unit. (2023). Córdoba. Regional document. https://upra.gov.co/Kit_Territorial/2-%20Información%20por%20Departamentos/CÓRDOBA/2-%20Documento%20Regional%20UPRA%20Córdoba.pdf.

Rüttinger, L., Stang, G., Smith, D., Taenzler, D., Vivekananda, J., 2015. *A new climate for peace – taking action on climate and fragility risks.* Executive Summary.

Salehyan, I., Hendrix, C.S., 2014. Climate shocks and political violence [Article]. Glob. Environ. Chang. 28 (1), 239–250. https://doi.org/10.1016/j.gloenvcha.2014.07.007.

Scheffran, J., Link, P., & Schilling, J. (2019). *Climate and Conflict in Africa*. https://doi.org/10.1093/acrefore/9780190228620.013.557.

Schipper, E.L.F., 2020. Maladaptation: when adaptation to climate change goes very wrong. One Earth 3 (4), 409–414. https://doi.org/10.1016/j.oneear.2020.09.014.

Schott, S., Buckley, N.J., Mestelman, S., Muller, R.A., 2007. Output sharing in partnerships as a common pool resource management instrument. Environ. Resour. Econ. 37 (4), 697–711. https://doi.org/10.1007/s10640-006-9062-7.

Sen, A., 1999. Development as Freedom. Oxford University Press, Oxford.

Sharif, S., Carranza-Franco, F., 2025. Delegative peacebuilding: explaining post-conflict selective violence. Confl. Manag. Peace Sci., 07388942251336643 https://doi.org/10.1177/07388942251336643.

Shimada, G., 2022. The impact of climate-change-related disasters on africa's economic growth, agriculture, and conflicts: can humanitarian aid and food assistance offset the damage? [Article]. Int. J. Environ. Res. Public Health 19 (1), 467. https://doi.org/10.3390/ijerph19010467.

Sitati, A., Joe, E., Pentz, B., Grayson, C., Jaime, C., Gilmore, E., Galappaththi, E., Hudson, A., Alverio, G.N., Mach, K.J., van Aalst, M., Simpson, N., Schwerdtle, P.N., Templeman, S., Zommers, Z., Ajibade, I., Chalkasra, L.S.S., Umunay, P., Togola, I., Global Adaptation Mapping Initiative, T., 2021. Climate change adaptation in conflict-affected countries: a systematic assessment of evidence. Discover Sustainab. 2 (1), 42. https://doi.org/10.1007/s43621-021-00052-9.

Slettebak, R.T., 2012. Don't blame the weather! climate-related natural disasters and civil conflict [Article]. J. Peace Res. 49 (1), 163–176. https://doi.org/10.1177/0022343311425693.

Smit, B., Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. Glob. Environ. Chang. 16 (3), 282–292. https://doi.org/10.1016/j.gloenvcha.2006.03.008.

Smith, D. (2004). Towards a Strategic Framework for Peacebuilding: Getting Their Act Together Overview report of the Joint Utstein Study of Peacebuilding. https://www.regjeringen.no/globalassets/upload/kilde/ud/rap/2004/0044/ddd/pdfv/210673-rapp104.pdf.

Smith, D., & Vivekananda, J. (2007). *A Climate of Conflict: The Links Between Climate Change, Peace and War* (9781898702900). https://www.international-alert.org/publications/climate-conflict/?gad_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhMeRVn_0tP6FUewxb1JQ7lYronIGZN2aPIkeEeOM7m3PajkE5YunE8aAoYuEALw_wcB.

Sosa, S., 2023. The micro-dynamics of conflict and peace: evidence from Colombia. Int. Interactions 49 (2), 163–170. https://doi.org/10.1080/03050629.2023.2189705.

Swatuk, L.A., Thomas, B.K., Wirkus, L., Krampe, F., Batista da Silva, L.P., 2021. The 'boomerang effect': insights for improved climate action [Article]. Clim. Dev. 13 (1), 61–67. https://doi.org/10.1080/17565529.2020.1723470.

Tamayo-Agudelo, W., Bell, V., 2019. Armed conflict and mental health in Colombia. Bjpsych Int 16 (2), 40–42. https://doi.org/10.1192/bji.2018.4.

Tavory, I., Timmermans, S., 2014. *Abductive Analysis : Theorizing Qualitative Research*. The University of Chicago Press.

Theisen, O.M., 2008. Blood and soil? Resource scarcity and internal armed conflict revisited [Review]. J. Peace Res. 45 (6), 801–818. https://doi.org/10.1177/0022343308096157.

Unit for Victims. (2023). *The Victims Unit paid out more than 16.8 billion pesos in compensation in Córdoba.* https://www.unidadvictimas.gov.co/unidad-para-las-victimas-entrego-mas-de-16800-millones-de-pesos-en/.

United Nations. (2010). *UN Peacebuilding: an Orientation* https://www.un.org/peacebuilding/sites/www.un.org.peacebuilding/files/documents/peacebuilding_orientation.pdf.

United Nations Environment Programme. (2009). *From conflict to peacebuilding. The role of natural resources and the environment.* . https://www.iisd.org/system/files/publications/conflict_peacebuilding.pdf.

Vestby, J., 2019. Climate variability and individual motivations for participating in political violence [Article]. Global Environ. Change-Human and Policy Dimens. 56, 114–123. https://doi.org/10.1016/j.gloenvcha.2019.04.001.

Vivekananda, J., Schilling, J., Smith, D., 2014. Climate resilience in fragile and conflict-affected societies: Concepts and approaches [Article]. Dev. Pract. 24 (4), 487–501. https://doi.org/10.1080/09614524.2014.909384.

von Uexkull, N., 2014. Sustained drought, vulnerability and civil conflict in Sub-Saharan Africa. Polit. Geogr. 43, 16–26. https://doi.org/10.1016/j.polgeo.2014.10.003.

von Uexkull, N., d'Errico, M., Jackson, J., 2020. Drought, resilience, and support for violence: household survey evidence from DR Congo [Article]. J. Confl. Resolut. 64 (10), 1994–2021. https://doi.org/10.1177/0022002720923400.

Walch, C., 2018. Disaster risk reduction amidst armed conflict: informal institutions, rebel groups, and wartime political orders. Disasters 42 (S2), S239–S264. https://doi.org/10.1111/disa.12309.

Whyte, J., Mottee, L., 2022. Projects as interventions. Int. J. Proj. Manag. 40, 934–940. https://doi.org/10.1016/j.ijproman.2022.10.007.

Yohe, G., Tol, R.S.J., 2002. Indicators for social and economic coping capacity—moving toward a working definition of adaptive capacity. Glob. Environ. Chang. 12 (1), 25–40. https://doi.org/10.1016/S0959-3780(01)00026-7.