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# The Impact of Environmental Cooperation on Peacemaking: Definitions, Mechanisms and Empirical Evidence

## Abstract

The literature on environmental peacemaking claims that groups in conflict can put aside their differences and cooperate in the face of shared environmental challenges, thereby facilitating more peaceful relations between them. This study provides the first comprehensive review of the widely dispersed empirical evidence on such environment-peace links. In order to do so, it distinguishes three understandings of peace and identifies four mechanisms connecting environmental cooperation to peace. The results suggest that environmental cooperation can facilitate the absence of violence within states as well as symbolic rapprochement within and between states, although such links are strongly dependent on the presence of several contextual factors. The most relevant mechanisms connecting environmental cooperation to peace are an increase in understanding and trust and especially the build-up of institutions. By contrast, environmental peacemaking is unlikely to have an impact on substantial integration between states or groups. Based on these findings, the article offers four suggestions for future research: (i) assess the relevance of environmental cooperation vis-à-vis other (presumably less context-dependent) drivers of peacemaking, (ii) pay more attention to the mechanisms connecting environmental cooperation to peacemaking, (iii) focus on the interactions between and the different time horizons of the three understandings of peace, and (iv) study the downside of environmental peacemaking to provide a more nuanced assessment and identify further relevant contextual factors.

**Keywords:** environment; peacemaking; diplomacy; cooperation; peacebuilding; disaster

## 1 Introduction

The Trifinio Plan has attempted to control environmental change [in El Salvador, Honduras and Nicaragua] [...] The Trifinio Plan changed the manner in which its stakeholders interact. Coordination and communication between the three governments has increased substantially. The Plan has also led to a higher level of integration among the border communities [...] it was instrumental in developing the idea of a more closely integrated Central America. (López 2004, 18)

The 2004 tsunami provided a catalyst for peace talks over the separatist conflict in Aceh, Indonesia, leading to its eventual resolution in 2005 [...] The tsunami acted as a circuit-breaker to these impediments, and allowed them to assume the high moral ground in seeking peace [...] On

the part of GAM, too, there was also a sense that ‘the people of Aceh have suffered enough’. Finally, once the attention of the international community was turned to Aceh [...] there was a view that both sides should compromise to reach a negotiated settlement. (Kingsbury 2007, 93-104)

The links between environmental problems — including climate change, renewable resource scarcity and natural disasters — and conflict have attracted considerable attention by scholars and policymakers alike (McDonald 2013; van Baalen and Mobjörk 2017). But, as the above quotes suggest, researchers have identified several cases where groups in conflict have put aside their differences and cooperated in the face of shared environmental challenges, thereby improving their overall relationship. Such examples are appealing as they suggest that under certain circumstances, two birds — namely environmental problems and intergroup conflict (even if it is unrelated to the environment) — can be killed with one stone, which is environmental cooperation.

Researchers use different labels when referring to such links between environmental problems, environmental cooperation and peace (henceforth termed environment-peace links), including “environmental peacemaking” (Conca 2002, 1), “environmental peacebuilding” (Carius 2006, 4), “environmental peace perspective” (Ide and Scheffran 2014, 273), “disaster diplomacy” (Kelman 2006, 215), “ecological diplomacy” (Griffin and Ali 2014, 230), “water diplomacy” (Islam and Repella 2015, 1) or “peace ecology” (Amster 2015, 1). While some of these labels are used interchangeably, others refer to distinct bodies of literature and intellectual traditions. Although this review acknowledges such differences, it largely puts them aside in order to focus on the larger picture that emerges from the theoretical and empirical literature on the potential for various forms of environmental cooperation to facilitate more peaceful relations between social groups (e.g., states, tribes, political movements).

In order to do so, this study synthesizes a large and widely dispersed body of literature. It places special emphasis on the empirical evidence for a link between environmental cooperation and different forms of peace as well as on the mechanisms underlying and contextual factors relevant for such a link. As this is the first comprehensive review on environment-peace links, it not only benefits the research field itself, but also related areas of study like environmental security, peace and conflict studies, environmental governance, international relations, or political geography. The article provides important insights for policymakers and practitioners striving to mitigate or adapt to environmental change or to prevent and transform (violent) conflicts as well. Finally, evidence of environment-peace links might serve to counter at times misleading and potentially self-fulfilling narratives of (future) environmental conflicts (Verhoeven 2014).

Given the scattered nature of the relevant evidence, I used a multi-track strategy to identify the relevant literature. This included keyword searches of the terms referring to environment-peace links (mentioned above) in Scopus, Google Scholar and several journals, forward and backward snowballing of references based on publications identified as relevant, and exchanges with other scholars working on environment-peace links. The main criterion for including a certain paper was whether it is concerned with the effects of environmental cooperation on peace, rather than with environmental cooperation or peace alone.

This article proceeds as follows: The second section introduces various definitions used to label environment-peace links, outlines their commonalities and develops a working definition for environmental peacemaking. It also introduces a continuum of different understandings of peace commonly used in the research field. Section 3 provides a brief overview of the theoretical mechanisms that are supposed to connect environmental cooperation to more peaceful intergroup relationships. Section 4 represents the core of this study and discusses whether, through which mechanisms and under what circumstances environmental cooperation facilitates the three different forms of peace identified in section 2. The results suggest that environmental cooperation can facilitate the absence of violent conflict and symbolic rapprochement. Such a link is most likely to be driven by common institutions and the build-up of trust and understanding, but highly dependent on a number of contextual factors. Afterwards, I outline pathways for future research (section 5) and draw a conclusion (section 6).

## **2 Definitions and Concepts**

As discussed in the introduction, scholars use various labels to classify research on environment-peace links. In this study, I opt to use the term *environmental peacemaking* to refer to this body of literature for three reasons. First, environmental peacemaking is the term introduced by Conca and Dabelko (2002), which is one of the first and most prominent studies on environment-peace links. Second, the term is broad enough to include a range of more issue-specific research results, for instance on water diplomacy (Islam and Repella 2015) or disaster diplomacy (Kelman 2012). Third, while the label environmental peacebuilding has become more popular recently, it is strongly associated with the wider research on environmental resources in post-conflict peacebuilding processes (Bruch, Muffett, and Nichols 2016; Troell and Weinthal 2014). This body of literature includes valuable insights on environment-peace links as discussed here. However, it is also simultaneously broader, as it encompasses studies on revenue sharing from the extraction of high-value resources or on the environmental impact of peacekeeping operations, and more narrow, because it is mainly concerned with post-civil war contexts.

While currently no widely accepted definition of environmental peacemaking or any of the closely related terms exists, there are three shared assumptions which constitute a common ground in the literature on environment-peace links. First, shared environmental problems are well-suited “for building bridges of communication and collaboration among parties in conflict” (Kyrou 2007, 87). This is true “even in cases where the conflict does not involve environmental issues” (Ali 2011, 32). Second, such “environmental cooperation can provide a common [...] basis for regional cooperation” (Barquet 2015, 15) and hence facilitate a further improvement of intergroup relations. Third, “environmental cooperation can be an effective general catalyst for reducing tensions, broadening cooperation, fostering demilitarization, and promoting peace” (Conca 2002, 9). In other words, environmental cooperation can contribute to negative (e.g., the absence of violence) as well as to positive forms of peace (e.g., integration between social groups) (Ide and Scheffran 2014; Schoenfeld et al. 2015).

In line with these three shared assumptions, this review employs a broad definition of its core term: *Environmental peacemaking refers to all forms of cooperation on environmental issues between distinct social groups which aims at and/or achieves to create less violent and more peaceful relations between these groups.* It can be considered successful if environmental cooperation contributes to the relationship between both groups becoming more peaceful.

In this context, the understanding of the term peace is of crucial importance. Indeed, no common definition of peace exists in the literature on environment-peace links. However, it is possible to distinguish between three broad understandings (or forms) of peace (although they might overlap considerably in individual studies). First, in line with negative definitions of the term, peace might simply refer to *the absence of violent conflict*. Accordingly, environmental peacemaking aims at “preventing the kind of violence that erupts due to the uncontrolled exploitation of natural resources, the destruction of ecosystems or the devastation of livelihoods based on natural resources” (Carius 2006, 6) or at the “prevention of conflict [in which] one or more states threaten or display or use force” (Barquet, Lujala, and Rød 2014, 3-4).

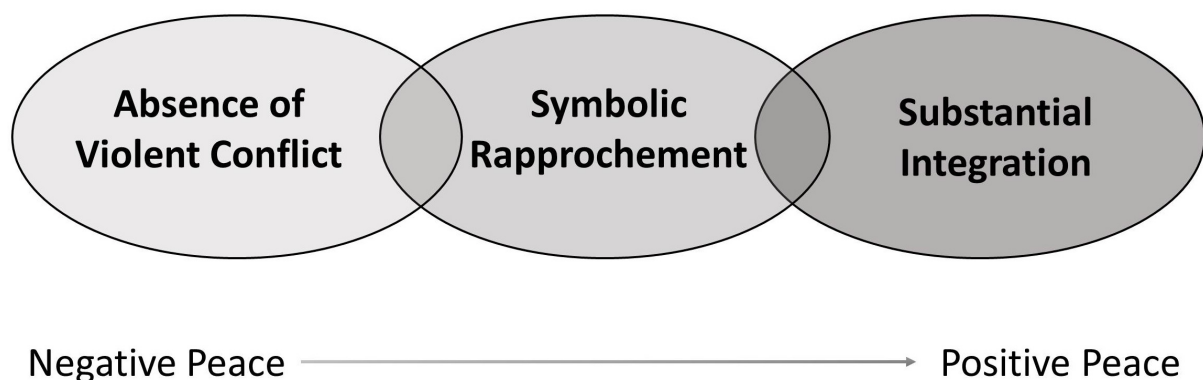
A second understanding conceives peace as a form of *symbolic rapprochement*. Peace is hence realized when “the conflicting parties [...] construct a common identity” (Akçalı and Antonsich 2009, 941), “when parties [...] begin to constitute themselves [...] in union with the other” (Lejano 2006, 573), or when “trust and confidence” exist (Griffin and Ali 2014, 233). Implicitly, this understanding of peace acknowledges the important role symbolic politics (e.g., labeling the other as a threat vs. conceiving it as an ally) plays in shaping conflict dynamics (Kaufman 2001). Simultaneously, it acknowledges that peace is more than the absence of violence, but also

includes “the inconceivability of violent conflict” due to positive symbolic relations (Conca 2002, 9).

Finally, peace is understood as being indicated by “regional integration” (Kaniaru 2015, 393), “increased [...] coordination and communication” (López 2004, 18) between social groups, or the creation of “positive forms of trans-societal interdependence” (Conca 2002, 10). In other words, peace is not limited to the absence of violent conflict and symbolic rapprochement, but also refers to a *substantial integration* of the respective communities or states in terms of institutions and/or trans-societal (e.g. economic or civil society) links. Examples of such an integration include the European Union (Swain 2016) and joint formal complaints to Israeli authorities by Israeli farmers and Arab Bedouins seeking to limit the discrimination of the latter (Tubi and Feitelson 2016).

Recently, researchers have increasingly conceived peace as a continuum reaching from negative to positive forms of peace (Goertz, Diehl, and Balas 2016; Kasten 2017). Inspired by these efforts, I suggest that the three understandings of peace employed in the environmental peacemaking literature can be ordered along a scale (see Figure 1). Though there is considerable overlap between the three phases, the absence of violent conflict is usually the first and most basic step towards more peaceful relations. Ideally, such absence of violence provides a stage for increased interactions and symbolic rapprochement, which, in turn, is a pre-condition for substantial integration. In the fourth section of this paper, I will use this continuum of understandings of peace to systematize existing evidence on environment-peace links.

**Figure 1: Understandings of peace in the environmental peacemaking literature ordered along a continuum**



### **3 Mechanisms Linking Environmental Cooperation to Peace**

In this section, I briefly outline the mechanisms through which environmental cooperation is hypothesized to contribute to more peaceful relationships between social groups. The

relevance of these mechanisms will be further assessed by the review of the empirical literature in the subsequent section. Scholars suggest four relevant environmental peacemaking mechanisms (Carius 2006; Ide and Scheffran 2014; Refisch and Jensen 2016), which are not mutually exclusive, but can occur simultaneously and interact in practice:

- 1) Improving the environmental situation (mechanism 1): Environmental problems can cause serious tensions within and between states. Examples include disputes about the Nile, Jordan and Euphrates-Tigris River Basins (Casção 2009; Harris and Alatout 2010) as well as clashes over water and land resources in Kenya, Thailand and Yemen (Ember et al. 2012; Hares 2009; Weiss 2015). If cooperation is successful in addressing resource scarcities, limiting uncoordinated exploitation, improving the environmental situation, and guaranteeing access to natural resources for the respective parties, such conflicts are likely to ease or might not even occur. This mechanism is hence important for achieving peace defined as the absence of violent conflict.
- 2) Increasing understanding and trust (mechanism 2): Early disaster sociology already noted that common exposure to natural disasters can produce a “community of sufferers” (Fritz 1996, 28) which is, at least in the initial post-disaster period, characterized by high in-group solidarity and decreased levels of conflict (Quarantelli and Dynes 1976). Social groups might also express empathy towards other groups suffering from environmental problems (verbally, but also by offering aid), thus improving relationships between those groups (Ker-Lindsay 2000). Once social groups start to cooperate in order to cope with (the impacts of) common environmental challenges, mistrust and prejudice are reduced while mutual understanding and the recognition of shared interests are facilitated (Schoenfeld et al. 2015; Swain 2016). Eventually, this might contribute to the establishment of “structures of care” (Lejano 2006, 571) and common identities (Conca 2002). This mechanism is therefore most important for realizing peace as symbolic rapprochement, but it might also pave the way for substantial integration.
- 3) Cultivating interdependence: Scholars have argued that shared environmental problems demonstrate interdependence between social groups and allow the realization of mutual gains, which facilitate cooperation even between hostile groups (Djernaes, Jorgensen, and Koch-Ya’ari 2015). Such perceptions of interdependence and the cooperation they induce can work towards symbolic rapprochement. According to functionalist theory (Haas 1970), spill-over processes will occur and broaden initial cooperation (and deepen independence) once the latter is established. For instance, state efforts to reduce floods through common or coordinated dam establishment provide incentives to cooperate on

hydro-energy as well, and can also open up opportunities for business and civil society actors to interact more frequently (Sadoff and Grey 2002; Scheumann and Shamaly 2016). Such processes of spill-over can facilitate more substantial integration between the respective social groups.

- 4) Building institutions: When cooperating on shared environmental problems, social groups frequently establish institutions such as the Nile Basin Initiative (Cascão 2009), and exchange forums between communal groups (Adano et al. 2012). In turn, these institutions provide communication channels and conflict resolution mechanisms regarding environmental, but also non-environmental issues, and can thus prevent (violent) conflicts. This is in accordance with evidence that shared membership in international organizations (Oneal and Russett 1999) and well-established institutions within states (Bogale and Korf 2007) significantly reduce the likelihood of violent interactions. Such institutions can also serve as forums for exchanges between decision makers (thus catalyzing symbolic rapprochement) and are instrumental for further (substantial) integration (King et al. 2016).

Table 1 provides an overview about these four mechanisms and stages of the peace continuum for which they are – in theoretical terms – supposed to be most relevant. The table will be used to structure the findings of the literature review at the end of section 4.

**Table 1: Theoretical relevance of the four environmental peacemaking mechanisms for the different stages of the peace continuum**

↓ Mechanism	Understanding of peace →	Absence of violence	Symbolic rapprochement	Substantial integration
(1) Improving the environmental situation				
(2) Increasing understanding and trust				
(3) Cultivating interdependence				
(4) Building institutions				

Explanation: Dark cells indicate that the mechanism is theoretically relevant for the respective stage of the peace continuum

#### 4 Assessing the Empirical Evidence on Environment-Peace Links

This section reviews the empirical literature on environment-peace links. It is structured along the three stages of the peace continuum (or understandings of peace) outlined in section 2 and aims to shed light on the questions of whether, through which mechanisms and in which contexts environmental cooperation facilitates peacemaking. For each understanding of peace, I



distinguish between intrastate and international contexts for two reasons. First, the dynamics of intra- and interstate conflicts are often quite different from each other (Melander, Pettersson, and Themnér 2016). And second, empirical findings for peace as symbolic rapprochement and especially for peace as the absence of violence diverge across this divide.

#### **4.1 Peace as Absence of Violent Conflict**

On the *international level*, there are several cases where states involved in intense conflicts started or continued to cooperate over environmental issues, and especially over shared rivers (Link, Scheffran, and Ide 2016). Examples include the Nile Basin Initiative (Salman 2013), the Mekong Committee (Jacobs 2002), and secret water negotiations between Israel and Jordan (Jägerskog 2007). The Indus Water Treaty (concluded in 1960) and the associated Indus Commission survived three wars between India and Pakistan. They provide both states with an elaborated instrument to negotiate competing claims to the Indus water against the background of growing water demand due to population growth and hydropower development (Zawahri 2011). In all of these cases, common institutions were established (mechanism 4) and, at least to a certain degree, the environmental situation improved for the states involved due to better coordination and management practices (mechanism 1).

However, the impact of an improved environmental situation on peace was extremely limited as violent interstate conflicts over water and other renewable resources are very unlikely – both in the cases mentioned and in general (Wolf, Yoffe, and Giordano 2003). Similarly, even well-functioning environmental governance institutions like the Indus Commission or the Mekong Committee were not used by decision makers to communicate in the face of a looming military confrontation.

Barquet et al. (2014) find that the existence of transboundary protected areas is significantly, although weakly correlated with a lower risk for militarized interstate disputes in Africa, Asia and the Middle East. This might be the case either because conservation cooperation is an indicator (rather than a driver) of better interstate relations or because the lack of such disputes is an indirect result of symbolic rapprochement or substantial integration (see section 5 for a further discussion of this issue). Also, between 1950 and 2006, there is no recorded military attack on a state that recently suffered from a natural disaster (Nelson 2010), but it is questionable whether this pattern is driven by post-disaster cooperation (Akcinaroglu, DiCicco, and Radziszewski 2011).

On the *intrastate level*, there are a number of well-documented violent conflicts over water, land and forests (Ide 2015). In Yemen, for instance, disputes over water are common due to

political instability, a dry climate, and an over-extraction of groundwater for development purposes (Weiss 2015). However, several quantitative studies find that armed conflict onset is significantly less likely after natural disasters (Slettebak 2012), in unusually dry years (Theisen 2012), and in regions with a low availability of arable land (Rowhani et al. 2011). Kreutz (2012, 498) discovers “an increased probability that [...] ceasefires [in civil wars] are concluded following natural disasters.” Besides being disputed by the results of other publications (Schleussner et al. 2016; von Uexkull et al. 2016), such studies face considerable problems in distinguishing whether this effect is due to environmental cooperation or caused by a change of strategic opportunities (Salehyan and Hendrix 2014). Adano et al. (2012), for instance, argue that pastoralist violence is less likely during times of drought because communities need a considerable labor force, hence making the mobilization of fighters more difficult.

The case study literature discusses a number of cases where different non-state communities work together to manage shared water resources and hence prevent the violent eruption of associated conflicts. In Yemen, for instance, competing communities increasingly establish formal or informal user associations to preserve shared water resources and manage related disputes (Taher et al. 2012). Similar cases have been reported from DR Congo (Burt and Keiru 2011), Ethiopia (Bogale and Korf 2007) and Kenya (Adano et al. 2012).

In all of these cases, both the improvement of the environmental situation (mechanism 1) and the building of institutions for conflict management (mechanism 4) played a crucial role in preventing violence. At least for resource-related conflicts, it is extremely difficult to disentangle whether the non-use of violence is related to an improved environmental situation, a better management of the related conflicts, or both. For the absence of violence in non-resource related conflicts, building institutions (mechanism 4) is clearly the more valid explanation. In line with this, Linke et al. (2015) find that (institutionalized) community dialogue mitigates rural violence in Kenya, but only if “activated” by droughts.

However, in the countries discussed above as well as in similar contexts, there is also a significant number of cases where no cooperation was initiated to cope with environmental stress or where such cooperation broke down in the face of intercommunity tensions (e.g, Ember et al. 2012; Ide 2015; Snorek, Renaud, and Kloos 2014). Similarly, in post-civil war contexts, efforts have been made to improve access to land and water resources in order to secure livelihoods (mechanism 1), but also to establish intergroup institutions (mechanism 4) (Troell and Weinthal 2014; Unruh and Williams 2013). But the success of these initiatives has often been very limited due continued insecurity and a lack of trust between the relevant parties (Aoki, Al-Lami, and Kugaprasatham 2011; Conca and Wallance 2012; Krampe 2016).

Consequentially, when understanding peace as the absence of violent conflict, environmental peacemaking works in intrastate (but not in interstate) settings. In line with theoretical expectations, the relevant mechanisms are an improvement of the environmental situation and the establishment of shared institutions. However, the success of environmental peacemaking is strongly dependent on a number of contextual factors. Based on the insights from the studies cited in this section, the most important of these contextual factors are the absence of recent intense violence, a (local) tradition of cooperation, and the availability of widely accepted local environmental knowledge. The recognition of established informal institutions by government authorities and support by external actors like NGOs or state programs are frequently mentioned as well.

In the case of Yemen discussed above, for instance, local knowledge about groundwater degradation was very widespread, but successful inter-community water management was only realized where intergroup hostilities were comparatively low, traditional local institutions (such as *sheiks* as broker and mediators) could be activated, and the state respected the communities' water-related agreements (Taher et al. 2012). Further support for these contextual factors is provided by research on community-based natural resource management, for which Ostrom (1990) outlines similar success principles. This is especially true with regard to the local acceptance of regulations and the support of management systems by formal (external) institutions.

In sum, then, environmental peacemaking can facilitate the absence of violent conflict, but only within states and only under certain circumstances. Mechanism 1 (improving the environmental situation) and especially mechanisms 4 (building institutions) are most relevant in this context.

#### **4.2 Peace as Symbolic Rapprochement**

The number of studies focusing on the links between environmental cooperation and symbolic rapprochement *within states* is limited. After the 2004 Indian Ocean tsunami, cooperation between rebel and government forces in providing post-disaster aid as well as increasing public solidarity “transformed the Indonesian public discourse on Aceh from a space of threat and danger into one of ‘national’ commiseration and solidarity” (Le Billon and Waizenegger 2007, 419). This boost in mutual understanding and solidarity (mechanism 2) as well as growing perceptions of interdependence in the wake of disasters (mechanism 3) catalyzed already ongoing negotiations between the Indonesia government and the Aceh-based rebels, eventually leading to a peace agreement in 2005 (Gaillard, Clavé, and Kelman 2008). Both

mechanisms can also be identified in successful environmental peacemaking processes in the Democratic Republic of Congo (Burt and Keiru 2011), Ethiopia (Bogale and Korf 2007) and Yemen (Taher et al. 2012).

In numerous other cases, by contrast, environmental cooperation had no sustained impact on the symbolic relations between intrastate conflict groups (Kreutz 2012; Walch 2014). Environment-related interdependencies were recognized and even acted upon in a large number of cases (Conca and Wallance 2012; Zahler et al. 2016). But the resulting cooperation was often either limited to a small group of engaged citizens and experts (Aggestam and Sundell-Eklund 2014; Krampe 2016) or even aggravated tensions (Le Billon and Waizenegger 2007). In Vietnam and Zambia, for instance, perceptions about the unfair distribution of the gains emerging from (common) water infrastructure projects aggravated communal tensions (Funder et al. 2012).

This suggests that recognizing and even cultivating interdependence (mechanism 3) is not sufficient to realize intrastate environmental peacemaking. Rather, building trust and understanding (mechanism 2) seems to be the relevant mechanism linking environmental cooperation to peace as symbolic rapprochement. Further, the success of this mechanism is again strongly dependent on a number of contextual factors. The most important are the absence of recent violence (implying that environmental peacemaking is difficult to realize in immediate post-conflict settings), the availability of traditional resource management knowledge, the potential long-term impact of environmental problems (which seem to raise the stakes for effective cooperation), and availability of external support, such as international aid in Aceh (Burt and Keiru 2011; Gaillard, Clavé, and Kelman 2008; Taher et al. 2012).

When compared to the intrastate level, more research is available on the effect of environmental cooperation on peace as symbolic rapprochement *between states*. One of the most prominent success stories in this context is the Trifinio Plan. It was launched in 1987 to promote regional water and conservation cooperation as well as to strengthen peace between El Salvador and Honduras in the final phase of their 147 year rivalry. The environmental management and coordination institutions built in the context of the Trifinio Plan (mechanism 4) facilitated interaction and trust building (mechanism 2), especially between high-ranking policy makers (but also between local communities along the border) (Artiga 2003; López 2004) and hence increased symbolic rapprochement between both states.

The Cordillera del Cóndor transboundary protected area also helped to maintain dialogue and to demilitarize the border zone between Peru and Ecuador after the end of their long-lasting conflict (Kakabadse, Caillaux, and Dumas 2016). Similar effects can be observed in the context of cooperation on the Rhine in post-1945 Europe (Swain 2016), on the Ganges between

Bangladesh and India (Brichieri-Colombi and Bradnock 2003), on Lake Titicaca between Bolivia and Peru (Walters 2012), and on the Virunga bioregion between the Democratic Republic of Congo, Rwanda and Uganda (Refisch and Jensen 2016). Similar to cooperation around the Trifinio region, mechanisms 2 (increasing trust and understanding) and 4 (building institutions) were deeply intertwined in facilitating symbolic rapprochement in these cases. More specifically, the institutions created in the context of environmental cooperation served as communication channels and exchange forums between decision makers, which in turn facilitated trust building, eventually contributing to symbolic rapprochement. The cultivation of interdependence via increasing perceptions of common challenges and shared benefits or via a spill-over of cooperation (mechanism 3), by contrast, only played a rather limited role in most cases.

The support and involvement of high-ranking policy makers (often presidents or ministers) seems to be an almost necessary condition for successful environmental peacemaking. In some cases, most notably the Virunga bioregion (where spill-over effects were also most relevant), low-level cooperation between activists, NGOs and local authorities paved the way for more formal conservation-related interactions between high-ranking politicians (Martin et al. 2011). But when no prominent decision makers are involved at all, even successful transboundary environmental cooperation between citizens and NGOs has very little impact on symbolic rapprochement between states. Examples of this include the Good Water Neighbors project in the Israeli-Jordanian-Palestinian context (Ide 2017; Reynolds 2017), Greek-Turkish post-earthquake solidarity (Akcinaroglu, DiCicco, and Radziszewski 2011), and the Nicosia Master Plan on the divided island of Cyprus (Jarraud and Lordos 2012). This finding is very much in line with theoretical expectations as rapprochement between states needs to involve some of the states' key decision makers at a certain point in time (Akçali and Antonsich 2009; Mackelworth 2012).

But even when high-ranking politicians are involved, there is a significant number of cases where environmental cooperation had little to no impact on the symbolic relations between states. These include Costa Rica-Nicaragua (Barquet 2015), the Sava River Basin (Colakhodži et al. 2014), South Africa-Zimbabwe-Mozambique (van Amerom and Büscher 2005), and Turkey-Syria (Scheumann and Shamaly 2016). Also, disaster-related cooperation, for instance between Greece and Turkey after the 1999 Izmir earthquake (Akcinaroglu, DiCicco, and Radziszewski 2011), has at best a short-term impact on the identity constructions of the conflict parties (Kelman 2012). In addition, there are numerous cases where states in conflict do not cooperate at all in the face of severe environmental problems, or where relations become even worse. Evidence for this claim is provided by Ethiopian-Eritrean differences about drought aid, Cuba

refusing assistance from the US in the wake of tropical storms, and the lack of environmental cooperation along the Korean border (Kelman 2006; Mjelde et al. 2017).

The large number of unsuccessful cases suggests that the link between environmental cooperation and peace as symbolic rapprochement (just as for peace as the absence of violent conflict) is highly context dependent. From the case studies discussed above, it is possible to identify a set of factors that increase the chance of successful environmental peacemaking between states. The most important are the involvement of high-ranking policy makers, the absence of strong political tensions (which lead to a securitization of cooperation efforts), the perceived mutuality and fairness of environmental cooperation, internal political stability (so that stable expectations and relations between decision makers can develop), agreement on the direness of the environmental situation, and external support (e.g. in the form of development aid or third-party mediation) (see also Dinar 2011; Feil, Klein, and Westerkamp 2009; Mackelworth 2012). But none of these factors is sufficient or necessary alone. For instance, high levels of external support and well-established environmental knowledge did not save cooperation around the Aral Sea from failing in ecological and peacemaking terms (Weinthal 2002).

To sum this section up: Environmental peacemaking facilitates symbolic rapprochement between non-state groups as well as between states, but this effect is highly contingent on a number of contextual factors (such as the absence of intense tensions or external support). On the intrastate level, increasing understanding and trust (mechanism 2) seems to be the most relevant mechanism. Between states, mechanism 2 (increasing understanding and trust) and mechanism 4 (building institutions) are often deeply intertwined in driving environment-peace links.

### **4.3 Peace as Substantial Integration**

There are few studies which focus on the impact of environmental cooperation on substantial integration between social groups. This might not be surprising as environmental peacemaking already shows limited success with regard to the prevention of violent conflicts and symbolic rapprochement, which are generally conceived as preconditions for substantial integration.

In line with this, researchers find little evidence for a link between environmental cooperation and substantial integration, both on the intra- and the interstate level. Within Israel, several Jewish *kibbutzim* cooperated with Arab Bedouin pastoralists during the 1957-1963 drought to sustain livelihoods, but later also by articulating political opposition and filing formal complaints against the discrimination of Bedouins (Tubi and Feitelson 2016). During the

drought in Southern Africa in the early 1990s, cooperation between the South African Development Community (SADC), South Africa and international donors intensified. This cooperation was not only instrumental in avoiding widespread famine, but also paved the way for the inclusion of South Africa into the SADC, which was initially founded by its geopolitical rivals (Holloway 2000). Further, environmental cooperation on the Trifinio region (El Salvador, Honduras, Nicaragua) and the Mekong River (Cambodia, Laos, Thailand, Vietnam) produced some spill-over effects (mechanism 3) in the form of collaboration on border delineation and hydropower development (Carius 2006: 13; Sokhem, Sunada, and Oishi 2007).

However, political and societal integration remained shallow and limited to a few less relevant issue areas in the cases of the Israeli drought (Tubi and Feitelson 2016), the Trifinio region (López 2004) and the Mekong (Jacobs 2002). Broader processes of reconciliation were the main driver of more substantial integration in Southern Africa (Thompson and Dreyer 2010). And other forms of — at times even quite intense — environmental cooperation in the Virunga region, around Lake Titicaca and on the Syrian-Turkish friendship dam produced hardly any substantial integration (Refisch and Jensen 2016; Scheumann and Shamaly 2016; Walters 2012). In accordance with this, the large-N study of Kreutz (2012) finds that natural disasters increase the chance for peace talks, but not for peace agreements.

So while there is little empirical literature on the issue, it seems that environmental cooperation has at best a very minor direct impact on peace as substantial integration. However, an indirect impact cannot be precluded yet. Environmental peacemaking can in some contexts contribute to the absence of violent conflict and facilitate symbolic rapprochement, which are important preconditions for substantial integration (see section 5 for a further discussion of this issue).

#### **4.4 Discussion**

Although evidence on environmental peacemaking is provided by a number of different research fields, theoretical perspectives and disciplinary accounts, four overarching conclusions can be drawn from the review of the empirical literature (see Table 2 for a visual summary): First, environmental cooperation can facilitate peace, although such an effect is strongly dependent on the presence of a set of context factors, such as the absence of high-intensity conflicts and external support. Second, environmental peacemaking is most likely to facilitate the absence of violence within states and symbolic rapprochement within as well as between states. Third, increasing understanding and trust (mechanism 2) and especially building institutions (mechanism 4) are the most relevant mechanisms linking environmental cooperation to peace,

while cultivating interdependence (mechanism 3) plays hardly a role. The relevant mechanisms are likely to interact in practice. Fourth, environmental cooperation has little to no direct impact on peace as substantial integration.

**Table 2: Summary of the core findings of the empirical environmental peacemaking literature**

Understanding of peace → ↓ Mechanism	Absence of violence	Symbolic rapprochement	Substantial integration
(1) Improving the environmental situation	Intrastate		
(2) Increasing understanding and trust		Intrastate Interstate	
(3) Cultivating interdependence			
(4) Building institutions	Intrastate	Interstate	
<b>Most relevant contextual factors</b>	<ul style="list-style-type: none"> <li>• Absence of recent violence</li> <li>• Tradition of cooperation</li> <li>• Consensual environmental knowledge</li> <li>• External support/recognition</li> </ul>	<ul style="list-style-type: none"> <li>• Absence of strong tensions</li> <li>• Involvement of relevant decision makers</li> <li>• High environmental stress</li> <li>• External support</li> </ul>	/

Note: No entries are made in the Substantial integration column as environmental cooperation is unlikely to facilitate substantial integration

## 5 Pathways and tasks for future research

Research on environment-peace-links is still at an early stage and relevant theoretical and empirical insights are provided by a number of different research fields. While such vitality and interdisciplinarity is certainly an asset, it also implies that more research is necessary to gain a more comprehensive understanding of the matter. In this section, I outline four tasks for future research. Three of those are connected to the key organizing principles and findings of the literature review (contextual factors, mechanisms, understandings of peace), while one is more general.

*First*, one key result of the review is that the success of environmental peacemaking is strongly dependent on a number of *contextual factors*. This begs the question of the relevance of environmental cooperation for peacemaking, especially when compared with other (presumably less context-dependent) factors. Critics can argue, for instance, that the absence of recent



violence, a tradition of low-level cooperation as well as external pressure and support are not relevant contextual factors for environmental peacemaking, but by themselves good predictors of positive or at least non-violent relations (Brock 1991). One way to assess the relative impact of environmental cooperation for peacemaking would be to conduct further in-depth case studies. These could trace which organizations and decision-makers interacted in which forums, which quality these interactions had, which follow-up meetings/agreements/institutions resulted from the interactions, if and how the involved decision-makers or broader populations changed their perceptions regarding the respective other, and which impact the relevant participants and/or public opinion had on wider political processes or conflict dynamics.

The other way to analyze the relevance of environmental cooperation as a driver of peace vis-à-vis other factors is to conduct quantitative studies for a large number of cases. In contrast to in-depth case studies, this methodological approach has so hardly been used to investigate environment-peace links (see Barquet, Lujala, and Rød 2014; Kreutz 2012 for exceptions). At an international level, researchers could use recent data on the termination of interstate rivalries (Thompson and Dreyer 2010) or changes in the peacefulness of dyadic relations (Goertz, Diehl, and Balas 2016) as the dependent variable. International environmental agreements in general (Mitchell 2003) and transboundary freshwater agreements (Giordano et al. 2014) and conservation areas (Barquet, Lujala, and Rød 2014) in particular might be useful independent variables.

Reliable data on the intrastate level is probably harder to compile. But information on the cessation and absence of violent conflict on various levels are available from a variety of datasets (e.g., Gleditsch et al. 2002; Raleigh et al. 2010). In order to operationalize environmental degradation and a number of relevant contextual factors, data can be collected from various international, national and academic institutions (e.g., Tollefsen, Strand, and Buhaug 2012). Surveys have been used successfully to assess the quality of local (environmental) cooperation and are also well-suited to study peace defined as symbolic rapprochement (Bogale and Korf 2007; Linke et al. 2015).

*Second*, this study has identified four *mechanisms* possibly connecting environmental cooperation to peace. Building institutions seems to be most relevant of them, while cultivating interdependence only plays a minor role. However, there has been little empirical research focusing explicitly on these mechanisms so far. Consequentially, this study is able to identify relevant contextual factors for the various understandings of peace, but not for the different mechanisms. It is also possible that my findings about the importance of different mechanisms for different understandings of peace (summarized by Table 2) are at least partially driven by the

(still limited) set of case studies available. Further studies which focus on additional regions or utilize different theoretical perspectives will maybe fill some empty spots in Table 2.

A crucial task for future research is therefore to study explicitly which mechanisms link environmental cooperation in which contexts to which forms of peace. In-depth case studies, especially when based on interviews with relevant decision makers, could provide helpful insights here. Another possibility would be to develop indicators for each of the four mechanisms, such as higher freshwater availability (improving the environmental situation), opinions of the other party in public polls (symbolic rapprochement), the extent of cooperation (on environment-related issues) (cultivating interdependence), or the number of institutions between both parties (building institutions). These indicators could then be used to assess the relevance of the four mechanisms for a medium or even large number of cases. As the mechanisms also interact and are entangled in practice (see section 4), such studies would also analyze whether particular combinations or temporally ordered sequences of mechanisms are particularly likely to result in successful environmental peacemaking.

*Third*, this review has identified three different *understandings of peace* used in the literature, which can be structured along a continuum. However, few studies explicitly state which of these (or alternative) understandings of peace is the outcome they are interested in. This makes it more difficult to assess which mechanisms and contextual factors are more or less relevant for a link between environmental cooperation and a specific stage of the peace continuum.

For instance, this study finds that environmental cooperation can facilitate the absence of violent conflict between intrastate groups. The absence of violent conflict, in turn, is also a crucial success condition for symbolic rapprochement, both in the context of environmental peacemaking (see section 4.2) and in general (e.g., Kaufman 2001). Consequentially, it is possible that environmental cooperation has an indirect impact on symbolic rapprochement if it does not facilitate rapprochement itself, but contributes to the prevention of violence. The studies of Bogale and Korf (2007) and Linke et al. (2015) provide tentative support for this hypothesis, but further research (also on the indirect impacts of environmental cooperation on substantial integration) is necessary. Similarly, environmental cooperation can contribute to symbolic rapprochement between social groups, which could have an indirect effect on preventing violence in the long-term (but not in the short-term, as time is needed to build better symbolic relations). This is well in line with Barquet et al.'s (2014) finding that the existence of a TBPA makes interstate militarized disputes between the respective states less likely.

Further, the explicit differentiation between different understandings of peace could give rise to debates about a hardly discussed question in research on environmental peacemaking:

What time horizons can we expect for environmental cooperation to have some impact on peace? While the prevention of violent conflict via an improved environmental situation or well-functioning institutions can be realized in the short-term, Ali (2007) and Martin et al. (2011) argue that symbolic rapprochement and substantial integration take place over longer time periods. Similarly, Ostrom (2000) emphasizes that local approaches tend to produce more robust forms of environmental cooperation, but often also take longer to be implemented. Kelman (2012, 14), by contrast, concludes that disaster-related cooperation can have an impact on symbolic relations between groups, but only when “considering a time-scale on the order of weeks and month.”

*Fourth*, while this review has largely focused on the relevant contexts, positive effects of and conditions for success of environmental peacemaking, it is worth mentioning — and researching — that environmental peacemaking can also have a downside. For example, environmental cooperation between states can cause the marginalization of local populations in the context of conservation areas (Marijnen and Verweijnen 2016; van Amerom and Büscher 2005) and dam projects (Sneddon and Fox 2006), or be a pretext for shared, unsustainable resource exploitation (Swain 2016). In the Middle East, environmental peacemaking projects have been criticized for failing to address structural inequalities regarding water access (especially between Israel and Palestine) and hence for depoliticizing them (Aggestam and Sundell-Eklund 2014). And the field of political ecology has intensively studied “the power relations inherent in defining, controlling and managing nature”, including cooperative management practices (Peluso and Watts 2001: 25)

Such negative effects of environmental cooperation are unlikely to improve the environmental situation for all relevant stakeholders (mechanism 1), to increase understanding and trust (mechanism 2), to cultivate interdependence (mechanisms 3), or to establish accepted and sustainable institutions (mechanism 4). They also cause grievances and can hence (i) contribute to the presence (rather than the absence) of violence and (ii) undermine (rather than facilitate) symbolic rapprochement. But especially at the intrastate level, little critical analysis of environment-peace links is available.

Such research would paint a more nuanced picture of the potentials and pitfalls of environmental peacemaking. But it is also instrumental in identifying further relevant contextual factors for environmental peacemaking. It remains debated, for instance, which design features of environment-related institutions and which degree of inclusivity are most suitable for facilitating environment-peace links (Carius 2006; Mitchell and Zawahri 2015; Selby 2013). Similarly, the literature on the commons identifies (incremental) sanctions as important for

sustainable resource management (Cox, Arnold, and Tomás 2010), but such sanctions can also be a cause of conflict

## 6 Conclusion

The purpose of this study was to structure and review the dispersed empirical evidence on environment-peace links. In order to do so, I first developed a working definition of environmental peacemaking based on assumptions widely shared in the relevant literature. The article then distinguished between three different understandings of peace employed by environmental peacemaking researchers, which can be thought of as a continuum: the absence of violent conflict, symbolic rapprochement and substantial integration. Afterwards, I assessed whether and under which circumstances environmental cooperation facilitates peacemaking. In this context, I distinguished between four mechanisms connecting environmental cooperation to peace: improving the environmental situation, increasing understanding and trust, cultivating interdependence, and building institutions.

The review of the empirical literature produced four main conclusions. The first and most important of these is that environmental peacemaking works at least in some contexts, although its success is strongly dependent on the presence of contextual factors, such as the absence of high-intensity conflict, external support, and locally accepted environmental knowledge. This finding provides an important corrective to most of the environmental and climate security literature, which too often narrowly focuses on the link between environmental change and conflict (Gemenne et al. 2014). It also suggests that International Relations research, which frequently uses environmental cooperation as a dependent variable (Young 2016), should pay attention the effects of such cooperation on intergroup relations.

The other three main conclusions specify which mechanisms are most likely to connect environmental cooperation to which forms of peace in which contexts: Second, environmental cooperation can facilitate the absence of violence within states as well as symbolic rapprochement within and between states. Third, environmental cooperation has little to no impact on peace as substantial integration. Fourth, building institutions (mechanism 4) is the most relevant mechanism linking environmental cooperation to peace, followed by increasing understanding and trust (mechanism 2). Cultivating interdependence (mechanism 3) plays hardly a role.

Based on the findings, I suggested four pathways for future research: (i) Scholars should assess the relevance of environmental cooperation vis-à-vis other (presumably less context-dependent) drivers of peacemaking in further details. (ii) The limited empirical knowledge

available on the mechanisms connecting environmental cooperation to peacemaking (as well as on the interactions between these mechanisms) begs for more explicit research on this issue. (iii) Further insights into the interactions between and different time horizons of the different stages of the peace continuum are needed. (iv) Focusing on the downside of environmental cooperation would provide a more nuanced picture of environmental peacemaking and can help to identify further relevant contextual factors.

Even in the light of these knowledge gaps, the findings of this study have a number of implications for policy makers, NGOs, development workers and conflict mediators. First, environmental cooperation can be a promising strategy for peacemaking unless the conflict parties have recently directed intense violence against each other. Second, external support (for instance through funding, mediation or supervision) increases the chances for success. Third, building institutions to address conflict, manage natural resources, and increase trust is a promising strategy for environmental peacemaking. And fourth, environmental cooperation should be designed in a conflict-sensitive and sustainable way to avoid negative side effects (Feil, Klein, and Westerkamp 2009).

To end with an optimistic note: Environmental peacemaking is certainly no silver-bullet solution to the environmental and conflict-related problems of the 21<sup>st</sup> century. But current research suggests it can at the very least help to address these problems, while also offering an important counterpoint to at times fatalist narratives about widespread instability and migration caused by environmental stress.

## References:

- Adano, Wario, Ton Dietz, Karen M. Witsenburg, and Fred Zaal. 2012. "Climate Change, Violent Conflict and Local Institutions in Kenya's Dryland." *Journal of Peace Research* 49 (1): 65-80.
- Aggestam, Karin, and Anna Sundell-Eklund. 2014. "Situating Water in Peacebuilding: Revisiting the Middle East Peace Process." *Water International* 39 (1): 10-22.
- Akçalı, Emel, and Marco Antonsich. 2009. "'Nature Knows No Boundaries': A Critical Reading of Undp Environmental Peacemaking in Cyprus." *Annals of the Association of American Geographers* 99 (5): 940-47.
- Akcinaroglu, Seden, Jon DiCicco, and Elizabeth Radziszewski. 2011. "Avalanches and Olive Branches: A Multimethod Analysis of Disasters and Peacemaking in Interstate Rivalries." *Political Research Quarterly* 64 (2): 260-75.
- Ali, Saleem H. 2011. "The Instrumental Use of Ecology in Conflict Resolution and Security." *Procedia Social and Behavioral Sciences* 14 (9): 31-34.
- Amster, Randall. 2015. *Peace Ecology*. Boulder: Paradigm Publishers.
- Aoki, Chizuru, Ali Al-Lami, and Sivapragasam Kugaprasatham. 2011. "Lessons Learned from Environmental Management of the Iraqi Marshlands in the Post-Conflict Period." *Water International* 36 (2): 197-206.
- Artiga, Raúl. 2003. *The Case of the Trifinio Plan in the Upper Lempa: Opportunities and Challenges for the Shared Management of Central American Transnational Basins*. Paris: UNESCO.

- Barquet, Karin, Päivi Lujala, and Jan Ketil Rød. 2014. "Transboundary Conservation and Militarized Interstate Disputes." *Political Geography* 42 (1): 1-11.
- Barquet, Karina. 2015. "'Yes to Peace'? Environmental Peacemaking and Transboundary Conservation in Central America." *Geoforum* 63 (1): 14-24.
- Bogale, Ayalneh, and Benedikt Korf. 2007. "To Share or Not to Share? (Non-)Violence, Scarcity and Resource Access in Somali Region, Ethiopia." *Journal of Development Studies* 43 (4): 743-65.
- Brichieri-Colombi, Stephen, and Robert W. Bradnock. 2003. "Geopolitics, Water and Development in South Asia: Cooperative Development in the Ganges–Brahmaputra Delta." *The Geographical Journal* 169 (1): 43-64.
- Brock, Lothar. 1991. "Peace through Parks: The Environment on the Peace Research Agenda." *Journal of Peace Research* 28 (4): 407-23.
- Bruch, Carl, Carroll Muffett, and Sandra S. Nichols. 2016. "Natural Resources and Post-Conflict Governance: Building a Sustainable Peace." In *Governance, Natural Resources, and Post-Conflict Peacebuilding* edited by Carl Bruch, Carroll Muffett, and Sandra S. Nichols, 1-31. London: Earthscan.
- Burt, Murray, and Bilha Joy Keiru. 2011. "Strengthening Post-Conflict Peacebuilding through Community Water-Resource Management: Case Studies from Democratic Republic of Congo, Afghanistan and Liberia." *Water International* 36 (2): 232-41.
- Carius, Alexander. 2006. *Environmental Peacemaking: Environmental Cooperation as an Instrument of Crisis Prevention and Peacebuilding: Condition for Success and Constraints*. Berlin: Adelphi.
- Cascão, Ana Elisa. 2009. "Changing Power Relations in the Nile River Basin: Unilateralism Vs. Cooperation?" *Water Alternatives* 2 (2): 245-68.
- Colakhodži, Amar, Marija Filipović, Jana Kovandzic, and Stephen Stec Stec. 2014. "The Sava River Basin: Transitioning to Peace in the Former Yugoslavia." In *Water and Post-Conflict Peacebuilding* edited by Erica Weinthal, Jessica Troell, and Mikiyasu Nakayama, 271-96. London: Earthscan.
- Conca, Ken. 2002. "The Case for Environmental Peacemaking." In *Environmental Peacemaking* edited by Ken Conca, and Geoffrey Dabelko, 1-22. Baltimore: John Hopkins University Press.
- Conca, Ken, and Geoffrey D. Dabelko. 2002. *Environmental Peacemaking*. Baltimore: John Hopkins University Press.
- Conca, Ken, and Jennifer Wallance. 2012. "Environment and Peacebuilding in War-Torn Societies: Lessons Form the Un Environment Programme's Experience with Post-Conflict Assessment." In *Assessing and Restoring Natural Resources in Post-Conflict Peacebuilding* edited by David Jensen, and Steve Lonergan, 63-84. London: Earthscan.
- Cox, Michael, Gwen Arnold, and Sergio Villamayor Tomás. 2010. "A Review of Design Principles for Community-Based Natural Resource Management." *Ecology and Society* 15 (4): 38-56.
- Dinar, Shlomi 2011. "Resource Scarcity and Environmental Degradation: Implications for the Development of International Cooperation." In *Beyond Resource Wars: Scarcity, Environmental Degradation and International Cooperation* edited by Shlomi Dinar, 289-305. Boston: MIT Press.
- Djernaes, Marina, Teis Jorgensen, and Elizabeth Koch-Ya'ari. 2015. "Evaluation of Environmental Peacemaking Intervention Strategies in Jordan-Israel-Palestine." *Journal of Peacebuilding & Development* 10 (2): 74-80.
- Ember, Carol C., Teferi Abate Adem, Ian Skoggard, and Eric C. Jones. 2012. "Livestock Raiding and Rainfall Variability in Northern Kenya." *Civil Wars* 14 (2): 159-81.
- Feil, Moira, Diana Klein, and Meike Westerkamp. 2009. *Regional Cooperation on Environment, Economy and Natural Resource Management: How Can It Contribute to Peacebuilding?* Brussels: Initiative for Peacebuilding.

- Fritz, Charles E. 1996. *Disasters and Mental Health: Therapeutic Principles Drawn from Disaster Studies*. Newark: Disaster Research Center.
- Funder, Mikkel, Rocío Bustamante, Vladimir Cossio, Pham Thi Mai Huong, Barbara van Koppen, Carol Mweemba, Imasiku Nyambe, Le Thi Thanh Phuong, and Thomas Skielboe. 2012. "Strategies of the Poorest in Local Water Conflict and Cooperation: Evidence from Vietnam, Bolivia and Zambia." *Water Alternatives* 5 (1): 20-36.
- Gaillard, Jean-Christophe, Elsa Clavé, and Ilan Kelman. 2008. "Wave of Peace? Tsunami Disaster Policy in Aceh, Indonesia." *Geoforum* 39 (1): 511-26.
- Gemenne, Francois, Jon Barnett, W. Neil Adger, and Geoffrey Dabelko. 2014. "Climate and Security: Evidence, Emerging Risks, and a New Agenda." *Climatic Change* 123 (1): 1-9.
- Giordano, Mark F., Alena Drieschova, James A. Duncan, Yoshiko Sayama, Lucia De Stefano, and Aaron T. Wolf. 2014. "A Review of the Evolution and State of Transboundary Freshwater Treaties." *International Environmental Agreements* 14 (3): 245-64.
- Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg, and Håvard Strand. 2002. "Armed Conflict 1946-2001: A New Dataset." *Journal of Peace Research* 39 (5): 615-37.
- Goertz, Gary, Paul F. Diehl, and Alexandru Balas. 2016. *The Puzzle of Peace: The Evolution of Peace in the International System*. Oxford: Oxford University Press.
- Griffin, Pamela J., and Saleem H. Ali. 2014. "Managing Transboundary Wetlands: The Ramsar Convention as a Means of Ecological Diplomacy." *Journal of Environmental Studies and Sciences* 4 (3): 230-39.
- Haas, Ernst B. 1970. "The Study of Regional Integration: Reflections on the Joy and Anguish of Pretheorizing." *International Organization* 24 (4): 607-46.
- Hares, Minna. 2009. "Forest Conflict in Thailand: Northern Minorities in Focus." *Environmental Management* 43 (3): 981-395.
- Harris, Leila M., and Samer Alatout. 2010. "Negotiating Hydro-Scales, Forging States: Comparison of the Upper Tigris/Euphrates and Jordan River Basins." *Political Geography* 29 (3): 148-56.
- Holloway, Ailsa. 2000. "Drought Emergency, Yes... Drought Disaster, No: Southern Africa 1991-93." *Cambridge Review of International Affairs* 14 (1): 254-76.
- Ide, Tobias. 2015. "Why Do Conflicts over Scarce Renewable Resources Turn Violent? A Qualitative Comparative Analysis." *Global Environmental Change* 33 (1): 61-70.
- . 2017. "Space, Discourse and Environmental Peacebuilding." *Third World Quarterly* 38 (3): 544-62.
- Ide, Tobias, and Jürgen Scheffran. 2014. "On Climate, Conflict and Cumulation: Suggestions for Integrative Cumulation of Knowledge in the Research on Climate Change and Violent Conflict." *Global Change, Peace & Security* 26 (3): 263-79.
- Islam, Shafiqul, and Amanda C. Repella. 2015. "Water Diplomacy: A Negotiated Approach to Manage Complex Water Problems." *Journal of Contemporary Water Research & Education* 155 (1): 1-10.
- Jacobs, Jeffrey W. 2002. "The Mekong River Commission: Transboundary Water Resources Planning and Regional Security." *The Geographical Journal* 168 (4): 354-64.
- Jägerskog, Andreas. 2007. "Why States Co-Operate over Shared Water: The Water Negotiations in the Jordan River Basin." In *Water Resources in the Middle East: Israel-Palestinian Water Issues - from Conflict to Cooperation* edited by Hillel Shuval, and Hassan Dweik, 195-202. Berlin: Springer.
- Jarraud, Nicolas Stephane, and Alexandros Lordos. 2012. "Participatory Approaches to Environmental Conflict Resolution in Cyprus." *Conflict Resolution Quarterly* 29 (3): 261-81.
- Kakabadse, Yolanda, Jorge Caillaux, and Juan Dumas. 2016. "The Peru and Ecuador Peace Park: One Decade after the Peace Settlement." In *Governance, Natural Resources, and Post-Conflict*

- Peacebuilding* edited by Carl Bruch, Carroll Muffett, and Sandra S. Nichols, 817-24. London: Earthscan.
- Kaniaru, Wanjiku. 2015. "From Scarcity to Security: Water as a Potential Factor for Conflict and Cooperation in Southern Africa." *South African Journal of International Affairs* 22 (3): 381-96.
- Kasten, Lukas. 2017. "When Less Is More: Constructing a Parsimonious Concept of Interstate Peace for Quantitative Analysis." *International Studies Review* 19 (1): 28-52.
- Kaufman, Stuart. 2001. *Modern Hatreds: The Symbolic Politics of Ethnic War*. Ithaca/London: Cornell University Press.
- Kelman, Ilan. 2006. "Acting on Disaster Diplomacy." *Journal of International Affairs* 59 (2): 215-40.
- . 2012. *Disaster Diplomacy: How Disasters Affect Peace and Conflict*. London: Routledge.
- Ker-Lindsay, James. 2000. "Greek-Turkish Reapproachement: The Impact of "Disaster Diplomacy"." *Cambridge Review of International Affairs* 14 (1): 215-32.
- King, Matthew Wilburn, Marco Antonio González Pastora, Mauricio Castro Salazar, and Carlos Manuel Rodríguez. 2016. "Environmental Governance and Peacebuilding in Post-Conflict Central America: Lessons from the Central American Commission for Environment and Development." In *Governance, Natural Resources, and Post-Conflict Peacebuilding* edited by Carl Bruch, Carroll Muffett, and Sandra S. Nichols, 777-802. London: Earthscan.
- Kingsbury, Damien. 2007. "Peace Processes in Aceh and Sri Lanka: A Comparative Assessment." *Security Challenges* 3 (2): 93-112.
- Krampe, Florian. 2016. "Water for Peace? Post-Conflict Water Resource Management in Kosovo." *Cooperation and Conflict* 52 (2): 147-65.
- Kreutz, Joakim. 2012. "From Tremors to Talks: Do Natural Disasters Produce Ripe Moments for Resolving Separatist Conflicts?" *International Interactions* 38 (4): 482-502.
- Kyrou, Christons N. 2007. "Peace Ecology: An Emerging Paradigm in Peace Studies." *International Journal of Peace Studies* 12 (1): 73-92.
- Le Billon, Philippe, and Arno Waizenegger. 2007. "Peace in the Wake of Disaster? Secessionist Conflicts and the 2004 Indian Ocean Tsunami." *Transactions of the Institute of British Geographers* 32 (2): 411-27.
- Lejano, Raul. 2006. "Theorizing Peace Parks: Two Models of Collective Action." *Journal of Peace Research* 43 (5): 563-81.
- Link, P. Michael, Jürgen Scheffran, and Tobias Ide. 2016. "Conflict and Cooperation in the Water-Security Nexus: A Global Comparative Analysis of River Basins under Climate Change." *Wiley Interdisciplinary Reviews Water* 3 (4): 495-515.
- Linke, Andrew M., John O'Loughlin, J. Terrence McCabe, Jaroslav Tir, and Frank D.W. Witmer. 2015. "Rainfall Variability and Violence in Rural Kenya: Investigating the Effects of Drought and the Role of Local Institutions with Survey Data." *Global Environmental Change* 34 (1): 35-47.
- López, Alexander. 2004. *Environmental Conflicts and Regional Cooperation in the Lempa River Basin: The Role of Central America's Plan Trifinio*. Berlin: adelphi.
- Mackelworth, Peter. 2012. "Peace Parks and Transboundary Initiatives: Implications for Marine Conservation and Spatial Planning." *Conservation Letters* 5 (2): 90-98.
- Marijnen, Esther, and Judith Verweijnen. 2016. "Selling Green Militarization: The Discursive (Re)Production of Militarized Conservation in the Virunga National Park, Democratic Republic of the Congo." *Geoforum* 75 (1): 274-85.
- Martin, Adrian, Eugene Rutagarama, Ana Elisa Cascão, Maryke Gray, and Vasudha Chhotray. 2011. "Understanding the Co-Existence of Conflict and Cooperation: Transboundary Ecosystem Management in the Virunga Massif." *Journal of Peace Research* 48 (5): 621-35.
- McDonald, Matt. 2013. "Discourses of Climate Security." *Political Geography* 33 (1): 42-51.
- Melander, Erik, Therése Pettersson, and Lotta Themnér. 2016. "Organized Violence, 1989–2015." *Journal of Peace Research* 53 (5): 727-42.



- Mitchell, Ronald B. 2003. "International Environmental Agreements: A Survey of Their Features, Formation, and Effects." *Annual Review of Environment and Resources* 28 (1): 429-61.
- Mitchell, Sara McLaughlin, and Neda A. Zawahri. 2015. "The Effectiveness of Treaty Design in Addressing Water Disputes." *Journal of Peace Research* 52 (2): 187-200.
- Mjelde, James W., Hyesun Kim, Tae-Kyun Kim, and Choong-Ki Lee. 2017. "Estimating Willingness to Pay for the Development of a Peace Park Using Cvm: The Case of the Korean Demilitarized Zone." *Geopolitics* 22 (1): 151-75.
- Nelson, Travis. 2010. "When Disaster Strikes: On the Relationship between Natural Disaster and Interstate Conflict." *Global Change, Peace & Security* 22 (2): 155-74.
- Oneal, John R., and Bruce Russett. 1999. "The Kantian Peace: The Pacific Benefits of Democracy, Interdependence, and International Organizations, 1885–1992." *World Politics* 52 (1): 1-37.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- . 2000. "Collective Action and the Evolution of Social Norms." *The Journal of Economic Perspectives* 14 (3): 137-58.
- Peluso, Nancy Lee, and Michael Watts. 2001. "Violent Environments." In *Violent Environments* edited by Nancy Lee Peluso, and Michael Watts, 3-38. Ithaca/London: Cornell University Press.
- Quarantelli, Enrico L., and Russell R. Dynes. 1976. "Community Conflict: Its Absence and Presence in Natural Disasters." *Mass Emergencies* 1 (1): 139-52.
- Raleigh, Clionadh, Andrew Linke, Håvard Hegre, and Joakim Karlsen. 2010. "Introducing Acled: An Armed Conflict Location and Event Dataset." *Journal of Peace Research* 47 (5): 651-60.
- Refisch, Johannes, and Jonhann Jensen. 2016. "Transboundary Collaboration in the Greater Virunga Landscape: From Gorilla Conservation to Conflict-Sensitive Transboundary Landscape Management." In *Governance, Natural Resources, and Post-Conflict Peacebuilding* edited by Carl Bruch, Carroll Muffett, and Sandra S. Nichols, 825-41. London: Earthscan.
- Reynolds, Kyra Marie. 2017. "Unpacking the Complex Nature of Cooperative Interactions: Case Studies of Israeli-Palestinian Environmental Cooperation in the Greater Bethlehem Area." *Geojournal* 82 (4): 701-19.
- Rowhani, Pedram, Olivier Degomme, Debarati Guha-Sapir, and Eric Lambin. 2011. "Malnutrition and Conflict in East Africa: The Impacts of Resource Variability on Human Security." *Climatic Change* 105 (1): 207-22.
- Sadoff, Claudia W., and David Grey. 2002. "Beyond the River: The Benefits of Cooperation on International Rivers." *Water Policy* 4 (5): 389-403.
- Salehyan, Idean, and Cullen Hendrix. 2014. "Climate Shocks and Political Violence." *Global Environmental Change* 28 (1): 239-50.
- Salman, Salman M.A. 2013. "The Nile Basin Cooperative Framework Agreement: A Peacefully Unfolding African Spring?" *Water International* 38 (1): 17-29.
- Scheumann, Waltina, and Omar Shamaly. 2016. "The Turkish-Syrian Friendship Dam on the Orontes River: Benefits for All? ." In *Water Resources Mmanagement in the Lower Asi-Orontes River Basin: Issues and Opportunities* edited by Aysegül Kibaroglu, and Ronald Jaubert, 125-37. Geneva: GIIDS.
- Schleussner, Carl-Friedrich, Jonathan F. Donges, Reik V. Donner, and Hans Joachim Schellnhuber. 2016. "Armed-Conflict Risks Enhanced by Climate-Related Disasters in Ethnically Fractionized Countries." *PNAS* 113 (33): 9216–21.
- Schoenfeld, Stuart, Asaf Zohar, Ilan Alleson, Osama Suleiman, and Galya Sipos-Randor. 2015. "A Place of Empathy in a Fragile Contentious Landscape: Environmental Peacebuilding

- in the Eastern Mediterranean." In *Geographies of Peace* edited by Fiona McConnell, Nick Megoran, and Philippa Williams, 171-93. London: I.B. Tauris.
- Selby, Jan. 2013. "Cooperation, Domination and Colonisation: The Israeli-Palestinian Joint Water Committee." *Water Alternatives* 6 (1): 1-24.
- Slettebak, Rune T. 2012. "Don't Blame the Weather! Climate-Related Natural Disasters and Civil Conflict." *Journal of Peace Research* 49 (1): 163-76.
- Sneddon, Chris, and Coleen Fox. 2006. "Rethinking Transboundary Waters: A Critical Hydropolitics of the Mekong Basin." *Political Geography* 15 (2): 181-202.
- Snorek, Julie, Fabrice G. Renaud, and Julia Kloos. 2014. "Divergent Adaptation to Climate Variability: A Case Study of Pastoral and Agricultural Societies in Niger." *Global Environmental Change* 29 (1): 371-86.
- Sokhem, Pech, Kengo Sunada, and Satoru Oishi. 2007. "Managing Transboundary Rivers: The Case of the Mekong River Basin." *Water International* 32 (4): 503-23.
- Swain, Ashok. 2016. "Water and Post-Conflict Peacebuilding." *Hydrological Sciences Journal* 61 (7): 1313-22.
- Taher, Taha, Bryan Bruns, Omar Bamaga, Adel Al-Weshali, and Frank Van Steenbergen. 2012. "Local Groundwater Governance in Yemen: Building on Traditions and Enabling Communities to Craft New Rules." *Hydrogeology Journal* 20 (6): 1177-88.
- Theisen, Ole Magnus. 2012. "Climate Clashes? Weather Variability, Land Pressure, and Organized Violence in Kenya, 1989-2004." *Journal of Peace Research* 49 (1): 81-96.
- Thompson, William R., and David R. Dreyer. 2010. *Handbook of International Rivalries: 1494-2010*. Los Angeles: CQ Press.
- Tollefsen, Andreas Forø, Håvard Strand, and Halvard Buhaug. 2012. "Prio-Grid: A Unified Spatial Data Structure." *Journal of Peace Research* 49 (2): 363-74.
- Troell, Jessica, and Erika Weinthal. 2014. "Shoring up Peace: Water and Post-Conflict Peacebuilding." In *Water and Post-Conflict Peacebuilding* edited by Erika Weinthal, Jessica Troell, and Mikiyasu Nakayama, 1-23. London: Earthscan.
- Tubi, Amit, and Eran Feitelson. 2016. "Drought and Cooperation in a Conflict Prone Area: Bedouin Herders and Jewish Farmers in Israel's Northern Negev, 1957-1963." *Political Geography* 51 (1): 30-42.
- Unruh, Jon, and Rohdri C. Williams. 2013. "Land: A Foundation for Peacebuilding." In *Land and Post-Conflict Peacebuilding* edited by Jon Unruh, and Rohdri C. Williams, 1-20. London: Earthscan.
- van Amerom, Marloes, and Bram Büscher. 2005. "Peace Parks in Southern Africa: Bringers of an African Renaissance?" *The Journal of Modern African Studies* 43 (2): 159-82.
- van Baalen, Sebastian, and Malin Mobjörk. 2017. "Climate Change and Violent Conflict in East Africa: Integrating Qualitative and Quantitative Research to Probe the Mechanisms." *International Studies Review* online ahead of print.
- Verhoeven, Harry. 2014. "Gardens of Eden or Hearts of Darkness? The Genealogy of Discourses on Environmental Insecurity and Climate Wars in Africa." *Geopolitics* 19 (4): 784-805.
- von Uexkull, Nina, Mihai Croicu, Hanne Fjelde, and Halvard Buhaug. 2016. "Civil Conflict Sensitivity to Growing-Season Drought." *PNAS* 113 (44): 12391-96.
- Walch, Colin. 2014. "Collaboration or Obstruction? Rebel Group Behavior During Natural Disaster Relief in the Philippines." *Political Geography* 43 (1): 40-50.
- Walters, Todd J. 2012. "Environmental Peace-Building in Peru and Bolivia: The Collaboration Framework for Lago De Titicaca." In *Parks, Peace, and Partnership: Global Initiatives in Transboundary Collaboration* edited by Michael S. Quinn, Len Broberg, and Wayne Freimund, 135-54. Calgary: University of Calgary Press.

- Weinthal, Erika. 2002. "The Promises and Pitfalls of Environmental Peacemaking in the Aral Sea Basin." In *Environmental Peacemaking* edited by Geoffrey Dabelko, and Ken Conca, 86-119. Baltimore: John Hopkins University Press.
- Weiss, Matthew. 2015. "A Perfect Storm: The Causes and Consequences of Severe Water Scarcity, Institutional Breakdown and Conflict in Yemen." *Water International* 40 (2): 251-72.
- Wolf, Aaron T., Shira B. Yoffe, and Mark Giordano. 2003. "International Waters: Identifying Basins at Risk." *Water Policy* 5 (1): 29-60.
- Young, Oran R. 2016. *On Environmental Governance: Sustainability, Efficiency, and Equity*. London: Routledge.
- Zahler, Peter, David Wilkie, Michael Painter, and J. Carter Ingram. 2016. "The Role of Conservation in Promoting Stability and Security in at-Risk Communities." In *Governance, Natural Resources, and Post-Conflict Peacebuilding* edited by Carl Bruch, Carroll Muffett, and Sandra S. Nichols, 545-59. London: Earthscan.
- Zawahri, Neda A. 2011. "Using Freshwater Resources to Rehabilitate Refugees and Build Transboundary Cooperation." *Water International* 36 (2): 167-17.