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# International Water Cooperation and Environmental Peacemaking

## **Abstract:**

Proponents of the environmental peacemaking approach argue that environmental cooperation has the potential to improve relations between states. This is the case because such cooperation facilitates common problem solving, cultivates interdependence, and helps to build trust and understanding. But as of yet, very few cross-case studies on environmental peacemaking exist. Further, much of the available literature understands peace in negative terms as the mere absence of acute conflict. This paper addresses both shortcomings by studying the impact of international water cooperation on transitions towards more peaceful interstate relations. In order to do so, we combine information on positive water-related interactions between states with the peace scale, a recent dataset measuring the degree of positive and negative peace between states. For the period 1956-2006, we find that a higher number of positive, water-related interactions in the previous ten years makes a shift towards more peaceful interstate relations more likely. This is particularly the case for state pairs that are not in acute conflict with each other.

## **Keywords:**

peacemaking; water; environment; peacebuilding; peace scale; basins at risk

## **Introduction**

Shortly after they gained independence in the first half of the 19<sup>th</sup> century, El Salvador and Honduras became involved in an intense, long-lasting conflict which involved several militarized disputes. The main reason for this conflict were disagreements about territory along their shared border and about some islands in the Gulf of Fonseca (Thompson and Dreyer 2010: 140-141). During the 1980s, both states intensified cooperation on environmental issues, among others to preserve transboundary water resources. Notable expressions of these efforts were the Trifinio Plan (1986) and the Central American Commission for Environment and Development (1989). These cooperation efforts facilitated interactions and joint problem solving between high-ranking policy makers and citizen from both countries. During the 1990s, the conflict de-escalated significantly (King et al. 2016; López 2004). Consequentially, analysts have argued that water and environmental cooperation between both states ‘acted as a catalyst for further cooperation’ (Carius 2006: 13). Similarly, scholars have attributed a peacemaking effect to secret water negotiations between Israel and Jordan, to the Orange-Senqu River Commission

(ORASECOM) between Botswana, Namibia, Lesotho and South Africa, and to the water regime governing the Okavango (Abukhater 2013; Turton 2003).

Cases like these suggest that international environmental cooperation might not only tackle environmental problems and facilitates sustainable development, but could also yield a peace dividend. This claim has been picked up by the literature on environmental peacemaking, which investigates whether environmental cooperation ‘can be an [...] effective catalyst for reducing tensions, broadening cooperation, fostering demilitarization, and promoting peace’ (Conca 2001: 226). In this study, ‘environmental peacemaking refers to all forms of cooperation on environmental issues [...] which [...] achieve creating less violent and more peaceful relations’ between states (Ide 2018b: 3). It is part of a broader effort — usually termed environmental peacebuilding — ‘of governing and managing natural resources and the environment to support durable peace’ (UNEP 2018).

So far, limited consensual knowledge on environmental peacemaking between states exists (Ide 2018b). Case studies from South America (Kakabadse et al. 2016), East Africa (Martin et al. 2011), the Middle East (Ide 2017) or Cyprus (Zikos et al. 2015) find that cooperation on water and biodiversity have contributed to the improvement of tense interstate relations. But other scholars, often focusing on the same cases, find little effect of environmental cooperation on wider interstate relations (Akçalı and Antonsich 2009; Barquet 2015; Colakhodži et al. 2014; Reynolds 2017). Some even argue that such cooperation depoliticizes conflicts and gives rise to new tensions (Aggestam and Sundell 2016; Büscher and Schoon 2009).

We recognise two shortcomings of this literature. First, available research on environmental peacemaking pays little attention to positive peace. In recent years, the dominant conception of peace as the absence of violence (negative peace) has been criticized in international relations (Diehl 2016), political geography (Williams and McConnell 2011), and peace and conflict studies (Gleditsch et al. 2014). Such a focus on negative peace restrains our knowledge on transitions from the mere absence of violence towards more positive forms of interactions (such as economic integration or security community). In a foundational text on environmental peacemaking, Conca (2002: 9) defines peace as ‘a continuum ranging from the absence of violent conflict to the inconceivability of violent conflict.’ However, almost all scholars doing research in this tradition either focus explicitly on the absence of violence (Barquet et al. 2014) or study cases of very tense international relations in which the avoidance of physical violence is an immediate concern, such as the Korean Peninsula (Mjelde et al. 2017), Peru-Ecuador until 1998 (Ali 2007) and Israel-Palestine (Reynolds 2017).

The second shortcoming of the current environmental peacemaking literature is that most available publications draw evidence from either one or very few cases, while there is a notable lack of cross-case investigations. We agree with Krampe (2017: 8) that the dominant case-study approach provides ‘a good basis, but [...] constrains comparison’ and generalisation as it is often based on rather different definitions and operationalisations of key variables (for instance, of environmental cooperation and peace). Recently, a few large-N studies on the issue have been published, but these focus solely on the avoidance of violent conflict (Dinar et al. 2015; Mitchell and Zawahri 2015) or utilise data on environmental treaties (Barquet et al. 2014; Ide 2018a), which might be weak proxies for actual environmental cooperation (see next section).

This article addresses both shortcomings — the lack of cross-case studies and the dominant focus on negative peace — in the environmental peacemaking literature. In order to do so, we focus on water-related cooperation in the face of environmental stress for three reasons. First, the existing literature largely agrees that water cooperation is the form of environmental cooperation most likely to yield a peace dividend, among others due to its cross-border nature as well as its economic and political relevance in many regions (Brochmann and Hensel 2009; Feil et al. 2009). Second, there is an extensive literature on water cooperation and conflict, which allows for a better specification of our theoretical expectations. Third, and relatedly, sufficient data on water interaction is available to test our theoretical propositions (Link et al. 2016; Petersen-Perlman et al. 2017).

More specifically, this article investigates the impact of water cooperation on transitions towards more peaceful relations between states for the period 1956-2006. In order to do so, data on positive, water-related interactions are combined with the peace scale recently developed by Goertz and colleagues (2016). We find that a higher number of positive, water-related interactions during the previous ten years increases the likelihood of a transition towards more peaceful relations between two states. This is especially so if these states are not in acute conflict with each other.

The remainder of this article introduces our theoretical framework and hypotheses, and explains the data and methods used. Afterwards, the results are presented and discussed, before a conclusion is drawn.

### **Theoretical Background: Water Cooperation and Peacemaking**

The literature on environmental peacemaking identifies two broad mechanisms through which water cooperation can facilitate the improvement of interstate relations (Conca 2001; Ide 2018b; Lejano 2006).

The first mechanism is rooted in liberal and functionalist theories of international politics. Liberal approaches have long claimed that highly interdependent states face little incentives to fight each other (Oneal and Russett 1999), but tend to cooperate in order to address shared problems and realise common gains (Keohane and Nye 2001). This should apply to environmental interdependence as well, for instance when rivers are shared or water pollution crosses political boundaries (Dinar 2009). In a functionalist logic, such cooperation is likely to spill over, that is, it 'will set in motion economic, social and political progresses which generate pressures towards further integration' (Tranholm-Mikkelsen 1991: 4), hence creating a virtuous cycle. As the case of the Syrian-Turkish dam on the Orontes River shows, cooperation on flood management is well able to catalyse further joint action on hydro-energy and the management of other watersheds (Scheumann and Shamaly 2016). Increased interdependence and cooperation, in turn, discourage the use of violence and facilitate the creation of a transnational community.

The second mechanism draws from constructivist theory and sociological institutionalism. According to Adler (1997: 254), citizens and policy makers tend to 'institutionalize commonalities running through the whole region, including shared perceptions of external threats.' Water-related problems are often perceived as severe, shared, and external threats (Conca 2002). Statements by key decision makers announcing the need or actual plans for water cooperation send signals to broader publics that better relations between the respective states are desired and possible (Sadoff and Grey 2002). Furthermore, once water cooperation is established, it increases interactions between decision makers and civil society actors (Ovodenko 2014). Such interactions can, in turn, stimulate the building of trust and understanding. This is based on the assumption that people 'develop perceptions of interest and understandings of desirable behavior from social interactions with others' (Finnemore 1996: 128). Water-related cooperation between Israeli and Palestinian communities, for instance, has been argued to give rise to more peace-prone discourses in the participating groups (Ide 2017).

In practice, these two mechanisms are usually deeply entangled and even reinforcing. The trust and understanding built during initial cooperation in the context of the Central American Commission for Environment and Development, for instance, laid the basis for further water cooperation between El Salvador and Honduras in the late 1980s, which in turn facilitated the peace process (King et al. 2016). Similarly, a spill-over of water cooperation under ORASECOM increased the number of interactions and institutions through which trust building in southern Africa could take place (Turton 2003).

One can hence hypothesise that water cooperation facilitates more peaceful relations between states through the building of trust and understanding and by increasing interdependence.

However, this begs the question of how to define and identify water cooperation, especially across a larger number of cases. Many existing studies on environmental peacemaking (Barquet et al. 2014; Ide 2018a) and international water interactions (Bernauer and Siegfried 2008; Ovodenko 2014) use formal treaties as indicators of cooperation.

But international water treaties might be very shallow, and even if they are well-designed, follow-up interaction facilitating trust building and a spill-over of cooperation is not guaranteed. In the worst case, environmental agreements even mask and reify severe conflicts (Zeitoun and Mirumachi 2008). The water accords concluded between Israel and Palestine in 1995 as articles of the Oslo II agreement, for instance, established a joint water committee (JWC). But the accords can hardly be termed cooperative given the continued strong tensions and grievances (especially on the Palestinian side), while no JWC meetings were held between 2010 and 2016 and little if any spill-over effects occurred (Selby 2013).

Hence, the kind of water cooperation which can stimulate environmental peacemaking processes is unlikely to be indicated by treaties alone. Neither are formal agreements necessary for environmental peacemaking. Rather, we propose that continuous and positive (i.e. non-hostile) water-related interactions between two or more states indicate the kind of water cooperation relevant for environmental peacebuilding. Such interactions include the formation of water treaties, but also meetings of policy makers or ministerial staff, various forms of cultural, scientific and economic cooperation, and public statements by state officials (Wolf et al. 2003). These interactions indicate (i) the spill-over (or at least continuation) of existing cooperation as well as (ii) the existence of forums and meetings where (and public statements through which) trust and understanding can be built (Ho 2017; Petersen-Perlman et al. 2017).

However, such interactions should be rather recent. Positive interactions that took place a long time ago are likely to be no longer part of the institutional memory of the state, while the involved technical experts may have retired and the broader public is concerned about more recent developments. Given that processes of spill-over and trust building still take some time (López 2004; Martin et al. 2011), we propose to categorise all interactions that took place during the last ten years as recent here. We acknowledge that this decision is somewhat arbitrary and that time lags of one, two and five years are more common in peace and conflict studies. But taking longer time periods reduces endogeneity concerns (water cooperation could be driven by informal improvements of mutual relations one or two years before such shifts are made official), while existing case studies on environmental peacemaking show that even time lags of two or five years might be too short (e.g., Abukhater 2013; Martin et al. 2011). Similarly, Barquet

et al. (2014) finds that conservation cooperation only has an effect of interstate violence prevention with a time lag of ten years.

Consequentially, our first hypothesis is:

*H1: A higher number of recent and positive water-related interactions make a shift towards more peaceful relations between two states more likely.*

Further, environmental peacemaking might not work if interstate relations are quite tense. In such a situation, positive water-related interactions are less likely to create deeper or wider interdependencies because cooperation remains securitised and receives little political support (Zikos et al. 2015). Similarly, an atmosphere of mistrust and limited interactions between decision makers and civil society actors restrains possibilities for building trust and understanding through water cooperation (Ide 2018a). We hence propose the following hypothesis:

*H2: Recent and positive water-related interactions are more likely to facilitate a shift towards more peaceful relations between two states if no acute conflict is going on between these states.*

Before the hypotheses are discussed in the light of the empirical results, the data and methods used for the analysis are explained.

## **Data and methods**

### *Dependent variable*

The transition towards more peaceful relationships between two states is the dependent variable of this study. Conceiving such shifts on a continuum that includes negative as well as positive forms of peace is no easy task for cross-case research. Most existing datasets only include data on the absence of acute or militarised conflicts, or transitions towards such a state (Palmer et al. 2015; Thompson and Dreyer 2010).

In this study, we draw on more recent efforts by Goertz, Diehl and Balas (2016) to construct a peace scale which measures the peacefulness of interstate relations. The number and severity of ‘disagreements and how they are dealt with by the participants are the key elements’ (Goertz et al. 2016: 28) used to position a state pair (dyad) along the peace scale in a given year. Specifically, Goertz and colleagues distinguish five levels of the peace scale, which are severe rivalry (0), lesser rivalry (0.25), negative peace (0.5), warm peace (0.75) and security community (1). In a severe

rivalry, states disagree about several key issues and resort to intense diplomatic pressure and frequently also to military violence in order to enforce their claims. Security communities, by contrast, are characterised by few disagreements as well as strong transnational ties and intergovernmental organizations, while violent encounters are unthinkable.

For each of the five stages of the peace scale, Goertz, Diehl and Balas (2016: 50-54) specify a set of indicators and several anchor cases (see Table 1 for an overview). They then use qualitative knowledge of the respective dyads, complemented by quantitative information, to classify the relationship between two states in a given year. Currently, peace scale data are available for all state-pairs with significant interactions for the period 1815-2006.

[Table 1 in here]

Because our hypotheses concern the improvement (rather than the absolute quality) of interstate relations, a shift of dyadic relations towards the positive end of the peace scale is the main dependent variable of this study. In order to operationalise this dependent variable for the time period under study (1956-2006), we use a binary dependent variable taking the value '1' for years, in which the peace value for a given dyad increased by 0.25 points or more relative to the previous year (e.g. from 'negative peace' to 'warm peace' or even 'security community'), and '0' otherwise.<sup>1</sup>

Using the peace scale has three particular advantages in the context of this study: First, it allows us to consider transitions from more (values of 0 and 0.25) towards less negative forms of peace (values of 0.25 and 0.5) as well as transitions towards positive forms of peace (values of 0.75 and 1) between states. Second, comparable data are available for a large number of cases. And third, the peace scale identifies clearly discernible, short-term shifts (rather than long-term, gradual changes) towards more peaceful relations. This reduces potential endogeneity concerns because we can discern whether intense positive water interaction precedes such a rapid shift.

This is not to say, however, that the peace scale data are free of weaknesses. One should keep in mind that this dataset is very recent, resulting in a higher risk of coding errors undetected so far. This is particularly important as the peace scale categorization relies heavily (though not solely) on the qualitative assessments of the researchers involved. Further, Kasten (2017) argues that the peace scale suffers from an ontological overload as it includes assumptions about the causal determinants of peace into its coding decisions (although these assumptions are less relevant for our study design). Still, in light of the advantages described above, we consider the peace scale

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<sup>1</sup> Readers interested in the distribution of positive vs. negative changes in the peace scale data for dyads in transboundary basins 1956-2006 are referred to Table 6 in the online appendix.



the best data source currently available to operationalise the dependent variable of this analysis. Summary statistics for our dependent variable and all other variables used in our analysis can be found in the online appendix (Table 4), along with a correlation table (Table 5).

### *Independent variable*

In order to determine the number of positive water-related interactions (WaRI) (which are used as indicators for water cooperation), this study draws on the International Water Events Database (IWED). This dataset records freshwater-related interactions that took place between 1946 and 2008 and orders them according to the Basins at Risk Water Event Intensity Scale (BAR scale) (Wolf et al. 2003). In order to construct IWED, researchers of the Oregon State University collected information on freshwater-related, international interactions from electronic news datasets and used the qualitative information provided to classify them along the BAR scale. This scale differentiates 15 categories of conflict and cooperation, ranging from -7 (formal declaration of war) to +7 (voluntary unification into one nation), with 0 referring to neutral or non-significant events (Yoffe and Larson 2001).

IWED and the BAR scale are considered reliable and widely used in the literature on water conflict and cooperation (Link et al. 2016). As we hypothesise that positive water-related interactions have a peacemaking effect, we utilise the cooperative side of the BAR scale to operationalise the independent variable. The following water-related events are hence considered to be positive interactions: minor exchanges and talks (+1), official verbal support (+2), cultural and scientific agreements or support (+3), economic and technological support (+4), military and strategic support (+5), conclusion of a major treaty (+6), and voluntary unification into one nation (+7, did not occur in the sample) (Wolf et al. 2003).

More specifically, we calculated the total number of positive water-related events between two states in the ten years preceding every dyad-year in our sample (by focussing on past events, we further reduce potential endogeneity). Our independent variable accounts for the fact that even less cooperative events according to the BAR scale, such as cultural and economic exchanges and support, can serve to build understanding and might indicate relevant spill-over processes (Ide 2017; Sadoff and Grey 2002). However, we use alternative specifications of the independent variable as a robustness test (see below).

### *Control variables*

We include several control variables into the analysis to account for possible confounding effects. First, we utilise a binary variable to control for historical shifts, or *shocks* in the international

system (i.e. decolonisation, end of the Cold War). Second, we count the *consecutive years a dyad has experienced negative peace* (negative peace or higher) and also include a quadratic term in the regression equation to account for a curvilinear relationship between peace years and shifts in interstate relations – i.e. we assume both, very recent enemies and long-term friends are more likely to see their relations improve, as compared to other pairs of states. Third, we control for participation in *interstate armed conflicts* outside of the dyad that could provide incentives for rapprochement between states within the dyad.

Fourth, following liberal theorists, we count the number of *international governmental organisations* (IGOs) both states of the dyad are common members of and include *logged trade data for the last ten years* between pairs of states (see Oneal and Russett 1999). Fifth, also following a liberal argumentation, we measure whether both states in a dyad are *democracies*, based on the polityIV data (Marshall et al. 2016). Finally, we account for relative military capacity, as suggested by realist theory (e.g., Bennett and Stam 2004; Zeitoun and Mirumachi 2008).

The rationale for including these control variables, as well as data sources and data transformations are discussed in greater detail in the online appendix (p. 4-5).

#### *Sample and estimation method*

Our sample includes all dyads of states within international river basins covered by the peace scale data, which only consider state-pairs with significant interactions during at least one point in time (Goertz et al. 2016). It covers the years 1956-2006. To estimate the effect of positive water-related interactions on the probability of an improvement of relations between states, we use logistic regression analysis. We cluster standard errors by dyad to account for within dyad similarities between observations and include time trends to control for a possible confounding effect of time, as the number of positive water-related interactions in our sample tends to increase over time.

Moreover, we conduct additional tests to check the robustness of our findings. First, we replace our main independent variable with counts of positive water-related events over shorter periods (two, five and eight years), with a variable counting only highly-ranked events (score of three or higher on the BAR scale), as well as a variable summing BAR scores over a ten-year period to give highly negative and positive events more weight in the analysis. Second, we test for a possible rare event bias, as recommended by King and Zeng (2001), because our dataset only contains a very small proportion of dyad years with positive changes in inter-state relations (1% of our sample). Third, we use dyad-random effects to control for unobserved time-invariant

dyad-specific characteristics that might have a bearing on water cooperation and interstate relations.

## Results

Table 2 shows the results of the main analysis. First we test for the effect of our control variables alone (Model 1). The model yields an area under the curve (AUC) estimate of roughly 0.74, indicating that it fits the peace scale data fairly well. Most of the coefficients are significant and have the expected sign. In particular, the likelihood of an improvement in the relations between contiguous states seems to increase with the number of international organisations both states in the dyad are common members of, the involvement of at least one state in an interstate armed conflict, with both states in the dyad being democracies, during system-level shocks, as well as with time, although the coefficient for the latter is only significant at the 10% level. Consistent with our expectations, the effect of peace years follows a u-shaped pattern as indicated by a negative coefficient for peace years and a positive coefficient for peace years squared. We also observe a negative coefficient for relative military capabilities, but it is not statistically significant.

[Table 2 in here]

We now turn to testing our main hypotheses in Models 2-4. In line with our first hypothesis we see a positive effect of the number of positive water-related interactions in the previous 10 years on the likelihood of a rapprochement between states (positive coefficient in Model 2 with a p-value smaller than 0.051). This effect is robust when replacing membership in international organisations with the volume of intra-dyad trade over the last 10 years, to a rare-event correction, as well as when controlling for unobserved heterogeneity between dyads in a dyad-random-effects-model. On the other hand, effects for alternative specifications of the independent variable are not significant. That is, restricting the analysis to more recent and more intensive cooperative events actually yields weaker results (see Table 3). Overall, hypothesis 1 thus receives support when observing longer time periods and including low- as well as high intensity cooperative events.

To test our second hypothesis, we divide our sample in dyads-years characterised by rather peaceful (Model 3: peace scale values 0.5, 0.75 and 1) or confrontative (Model 4: peace scale values 0 and 0.25) relations. In general, we observe that the average likelihood of a shift towards more peaceful relations is lower in the peaceful, and higher in the confrontative sample, as indicated by the coefficient for the constant in Model 3 and 4. Yet, we also see that the effect of

positive water-related events is much larger in the peaceful sample than in the overall sample, which is consistent with hypothesis 2. On the other hand, we do not see a statistically significant effect of positive water-related interactions in the confrontative sample.

[Table 3 in here]

To describe our results in substantive terms, we estimate incremental changes in the probability of a positive shift in interstate relations as a function of the number of positive water-related events between these states in the last ten years, with all other variables held constant at their mean. We then compare the results with the estimated effect of total trade between these states over the same period. To ensure comparability, we use the coefficients from Model 10 for both estimations. The results are shown in Figure 1. We estimate for instance that, all else equal, the effect of a shift from 1 to 4 positive water-related events is roughly comparable to the effect of a change from 12 to 40 billion \$US in trade volume (i.e. an increase in the probability of a positive shift in interstate relations of roughly 12.5%).

[Figure 1 in here]

**Figure 1: Estimated changes in the probability of a positive shift in interstate relations as a function of the number of positive water-related interactions in the last ten years (left) and overall trade between states in the last ten years (right). Shaded areas delimit 95% confidence bands. Superimposed bars represent the distribution of observations.**

We conclude that the number of positive water-related interactions within a dyad increases the probability of this dyad moving towards the positive end of the peace scale. This effect seems to apply in particular to dyads with rather harmonious relations, thus supporting our argument that environmental peacemaking is most likely to take place in settings characterised by the absence of intense hostilities.

## **Discussion**

The results of our study provide support for the environmental peacemaking approach: A higher number of positive, water-related interactions during the previous ten years makes a shift towards more peaceful relations between two states more likely, at least if the states are not in acute conflict with each other.

A cursory view on the qualitative literature suggests that this relationship is not a statistical artefact, but underpinned by observable mechanisms. The informal ‘picnic table talks’ on water between decision makers from Israel and Jordan served as one means to build trust and working relations between both sides, which facilitated the peace talks in the 1990s. During the initial stages of these talks, diplomats also turned to positive-sum topics like water cooperation several times in order to move the negotiations forward when a stalemate occurred (Abukhater 2013; Haddadin 2011). Similarly, the negotiation and conclusion (in 1996) of the Mahakali Treaty paved the way for further water cooperation between India and Nepal and set a positive atmosphere for the upcoming (and eventually successful) negotiations about the renewal of the bilateral trade agreement (Swain 2002). High-level water-related interactions also served as trust building tools during the reconciliation process between El Salvador and Honduras from 1986 to 1992 (López 2004).

Taken together, the qualitative evidence seems to suggest that building trust and setting positive symbols (highlighted by constructivist theories) is more relevant as an environmental peacemaking mechanism than a spill-over of cooperation (emphasised by liberal approaches) (see also Ide 2018b), although more research on the issue is needed. Insights from these and other case studies also strengthen the arguments that the relevant correlations are not driven by reverse causality: Positive water-related interactions are not (merely) expressions of a very early stage of a peacemaking process, but can actively catalyse a shift towards more peaceful international relations.

This effect is particularly pronounced in the sample of dyads that are already characterised by negative or warm peace and absent for dyads with more tense relations. This finding is in line with a recent cross-case study claiming that already ongoing reconciliation processes are necessary for successful environmental peacemaking (Ide 2018a), but also with qualitative evidence. When analysing cross-border water cooperation in Cyprus, Zikos et al. (2015) show that in situations of intense hostility, scepticism towards environment-related interactions prevails, frequently leading to public resistance against and state repression of cross-border cooperation. Further, even if considerable water-related cooperation takes places, for instance between India and Pakistan on the Indus River, its effect on the overall situation is rather limited if conflict is far more prevalent than cooperation in other domains (Swain 2002).

Previous qualitative and quantitative studies also suggest that if environmental cooperation contributes to environmental peacemaking, it is usually not the most important factor, but rather combines with and reinforces other processes such as political negotiations, external mediation and economic coordination (Ide 2018b). In line with this, the inclusion of WaRI does hardly

improve the model fit (Table 2), hence indicating that water-related cooperation is not the most important predictor of shifts towards more peaceful relations..

These results speak to the wider literature in at least two broad ways. First, scholars of international relations and international water politics have for a long time conceived environmental cooperation as a dependent variable whose occurrence (Giordano et al. 2014; Young 2016) and effectiveness (Garrick and De Stefano 2016; Mitchell and Zawahri 2015) has to be explained. Conversely, scholars of rivalry termination and international peacemaking have so far hardly paid attention to environmental issues in general and to water cooperation in particular as relevant explanatory factors (e.g., Goertz et al. 2016; Kupchan 2010; Rasler et al. 2013). The findings of our study highlight that environmental and especially water cooperation can also be conceived of as independent variables which potentially have a transformative effect on international politics by catalysing shifts towards more peaceful relations.

Second, a large literature has discussed the question of whether renewable resource scarcity and climate change are potential causes of violent conflict, with water being a key component of these debates (Sakaguchi et al. 2017; Seter et al. 2018). But our results indicate that environmental cooperation in the form of positive water-related interactions also offers opportunities for forging closer ties between states, hence supporting calls in the environmental security literature to focus stronger on cases of peaceful adaptation to environmental stress (Adams et al. 2018).

This said, several uncertainties and puzzles remain.

Just like Barquet et al. (2014), we find that environmental peacemaking is a long-term process that needs a decade or more to show results. In contrast to a time lag of ten years, the number of WaRIs in the previous two, five and eight years is still positively, but no longer significantly correlated with shifts towards more peaceful relations in our analysis (Table 3). But another cross-case study on environmental cooperation and international reconciliation yields the most significant results when using a time lag of five years (Ide 2018a). Several case studies, for example on Israeli-Jordanian water negotiations in the 1990s (Haddadin 2011) and the Mahakali Treaty between India and Nepal (Swain 2002), also provide some support for a more short-term effect of environmental cooperation as well. These disparate findings reveal that the temporal dimensions of (water-related) environmental peacemaking are not well understood yet.

There are also some potential issues with the datasets we used. The peace scale data, for instance, is pretty new and coding errors might not yet have been detected. This is especially relevant when it comes to secret or informal agreements, which already indicate an improvement of mutual relations months or years before official declarations are made. If the improvements of

relations in a dyad started earlier than indicated by the peace scale data, this could raise endogeneity concerns because some of the WaRI would have taken place after relations already (slightly) improved. However, we believe that using a time lag of one to ten years provides a safeguard against such problems.

Further, the data on water-related interactions could be biased as the underlying databases tend to underreport events for countries which are peripheral or where English is not an official language. This is especially the case for minor cooperative events. We cannot tell whether and how such a bias affects our results. Also, IWED does hardly contain data on secret water negotiations, but researchers have argued that such negotiations can be crucial for building trust between both sides, as exemplified by the secret ‘picnic table talks’ between Israel and Jordan (Abukhater 2013).

## **Conclusion**

This study provides one of the first empirical, cross-case tests of the environmental peacemaking approach. Specifically, we analyse whether positive, water-related interactions in the previous ten years make a shift towards more peaceful relations between two states more likely. Our results suggest that such water cooperation indeed has a positive and significant effect on the improvement of interstate relations. This is particularly the case for dyads which are free of acute conflicts and a least characterised by negative peace. 62% of the dyad-years in our sample belong to the latter category, including several cases which feature considerable tensions, such as Armenia-Turkey (1992-2006), Egypt-Israel (1990-2006) and Qatar-Saudi Arabia (1972-2006). Our findings are highly relevant as they suggest that policy makers, donors and civil society activists could address concerns related to environmental degradation and peace and security simultaneously by facilitating international water cooperation (Conca 2002).

Our study suggests several promising pathways for future research. To start with, it is worth for environmental security scholars to focus not only on instances of conflict and violence, but also of cooperation and peacebuilding in the face of environmental stress. This is particularly the case for the intrastate level, which is not in the focus of this article, but on which environmental and climate security scholars have built considerable expertise (Seter et al. 2018).

Further, research on international relations and environmental politics should pay more attention to environmental cooperation as an independent variable rather than as a (desired) outcome to be explained. This would allow for fruitful cooperation between environmental politics research and peace studies to enhance knowledge on environmental peacemaking (which is a very young research field). Scholars have gone a long way, for instance, in figuring out how water

cooperation might be achieved and how water conflict can be avoided (e.g., Ovodenko 2014; Petersen-Perlman et al. 2017; Zeitoun and Mirumachi 2008). As demonstrated by our study, drawing on this expertise and data strongly benefits research on the impact of water cooperation on wider international relations.

When conceiving environmental cooperation as an independent variable, there are several options to move research on international environmental peacemaking forward. An improved peace scale with more than five categories would allow for a more nuanced analysis, but one can also draw on other indicators of more peaceful relations, such as reconciliation (Rasler et al. 2013), the absence of militarised disputes (Barquet et al. 2014), and closer economic ties (Barbieri et al. 2009).

An improvement of international relations can also be facilitated by cooperation on other environmental issues, such as conservation and renewable energies. Cooperation on and peacemaking linked to these topics might follow different trajectories, for instance because water (just like energy) issues are often more closely tied to strong political and economic interests than conservation concerns (Weinthal 2004). We hence encourage the development of environment-related interaction datasets similar to IWED, for instance by extracting information from the Global Database on Events, Language and Tone (GDELT 2018). Researchers could also utilise data on transboundary conservation areas (Barquet et al. 2014) and international environmental agreements (Ovodenko 2016). Coding existing agreements for institutionalised cooperation provisions (such as joint management boards) would allow more nuanced analyses of the impact of (various form of) environmental cooperation on interstate relations.

Finally, the causal mechanisms connecting environmental cooperation to peacemaking and especially the time scales on which they operate are not fully understood yet (see discussion section) and deserve further attention by both quantitative and qualitative studies. Conducting research along these lines would allow for fruitful interdisciplinary cooperation and further the capability of environmental peacemaking research to provide policy-relevant insights.

## References:

- Abukhater, Ahmed. 2013. *Water as a Catalyst for Peace: Transboundary Water Management and Conflict Resolution*. London: Earthscan.
- Adams, Courtland, Tobias Ide, Jon Barnett and Adrien Detges. 2018. *Sampling Bias in Climate-Conflict Research*. *Nature Climate Change* 8(3): 200-203.
- Adler, Emmanuel. 1997. *Imagined (Security) Communities: Cognitive Regions in International Relations*. *Millennium* 26(2): 249-277.
- Aggestam, Karin and Anna Sundell. 2016. *Depoliticizing Water Conflict: Functional Peacebuilding in the Red Sea–Dead Sea Water Conveyance Project*. *Hydrological Science Journal* 61(7): 1302-1312.



- 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): 940-947.
- Ali, Saleem H. 2007. A Natural Connection between Ecology and Peace? In *Peace Parks: Conservation and Conflict Resolution*, edited by Ali, Saleem (ed.), 1-18. Cambridge: MIT Press.
- Barbieri, Katherine, Omar M.G. Kshek and Brian Pollins. 2009. *Trading Data: Evaluating Our Assumptions and Coding Rules*. *Conflict Management and Peace Science* 26(5): 471-491.
- 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.
- Bennett, Scott and Allan C. Stam. 2004. *The Behavioral Origins of War*. Ann Arbor: University of Michigan Press.
- Bernauer, Thomas and Tobias Siegfried. 2008. *Compliance and Performance in International Water Agreements: The Case of the Naryn/Syr Darya Basin*. *Global Governance* 14(4): 479-501.
- Brochmann, Marit and Paul R. Hensel. 2009. *Peaceful Management of International River Claims*. *International Negotiation* 14(2): 391-416.
- Büscher, Bram and Michael Schoon. 2009. *Competition over Conservation: Collective Action and Negotiating Transfrontier Conservation in Southern Africa*. *Journal of International Wildlife Law & Policy* 12(1): 33-59.
- Carius, Alexander. 2006. *Environmental Peacemaking: Environmental Cooperation as an Instrument of Crisis Prevention and Peacebuilding: Condition for Success and Constraints*. Berlin: Adelphi.
- Colakhodži, Amar, Marija Filipović, Jana Kovandzic and Stephen Stec. 2014. The Sava River Basin: Transitioning to Peace in the Former Yugoslavia. In *Water and Post-Conflict Peacebuilding*, edited by Weinthal, Erica, Jessica Troell and Mikiyasu Nakayama (eds.), 271-296. London: Earthscan.
- Conca, Ken. 2001. Environmental Cooperation and International Peace. In *Environmental Conflict*, edited by Diehl, Paul F. and Nils Petter Gleditsch (eds.), 225-247. Boulder: Westview.
- Conca, Ken. 2002. The Case for Environmental Peacemaking. In *Environmental Peacemaking*, edited by Conca, Ken and Geoffrey Dabelko (eds.), 1-22. Baltimore: John Hopkins University Press.
- Diehl, Paul F. 2016. *Exploring Peace: Looking Beyond War and Negative Peace*. *International Studies Quarterly* 60(1): 1-10.
- Dinar, Shlomi. 2009. *Scarcity and Cooperation Along International Rivers*. *Global Environmental Politics* 9(1): 109-135.
- Dinar, Shlomi, David Katz, Lucia De Stefano and Brian Blankespoor. 2015. *Climate Change, Conflict, and Cooperation: Global Analysis of the Effectiveness of International River Treaties in Addressing Water Variability*. *Political Geography* 45(1): 55-66.
- 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.
- Finnemore, Martha. 1996. *National Interests in International Security*. Ithaca: Cornell University Press.
- Garrick, Dustin Evan and Lucia De Stefano. 2016. *Adaptive Capacity in Federal Rivers: Coordination Challenges and Institutional Responses*. *Current Opinion in Environmental Sustainability* 21(1): 78-85.
- GDELT. 2018. The Gdelt Project. <https://www.gdeltproject.org/> (13/05/2018).
- 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): 245-264.
- Gleditsch, Nils Petter, Jonas Nordkvelle and Havard 2014 Strand. 2014. *Peace Research - Just the Study of War?* *Journal of Peace Research* 51(2): 145-158.

- 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.
- Haddadin, Munther J. 2011. *Water: Triggering Cooperation between Former Enemies*. *Water International* 36(2): 178-185.
- Ho, Selina. 2017. *Introduction to 'Transboundary River Cooperation: Actors, Strategies and Impact'*. *Water International* 42(4): 97-104.
- Ide, Tobias. 2017. *Space, Discourse and Environmental Peacebuilding*. *Third World Quarterly* 38(3): 544-562.
- Ide, Tobias. 2018a. *Does Environmental Peacemaking between States Work? Insights on Cooperative Environmental Agreements and Reconciliation in International Rivalries*. *Journal of Peace Research* 55.
- Ide, Tobias. 2018b. *The Impact of Environmental Cooperation on Peacemaking: Definitions, Mechanisms and Empirical Evidence*. *International Studies Review* online ahead of print.
- 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 Bruch, Carl, Carroll Muffett and Sandra S. Nichols (eds.), 817-824. London: Earthscan.
- Kasten, Lukas. 2017. *When Less Is More: Constructing a Parsimonious Concept of Interstate Peace for Quantitative Analysis*. *International Studies Review* 19(1): 28-52.
- Keohane, Robert O. and Joseph Nye. 2001. *Power and Interdependence*. New York: Longman.
- King, Gary and Langche Zeng. 2001. *Logistic Regressions in Rare Events Data*. <https://gking.harvard.edu/files/0s.pdf> (06/06/2017).
- 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 Bruch, Carl, Carroll Muffett and Sandra S. Nichols (eds.), 777-802. London: Earthscan.
- Krampe, Florian. 2017. *Towards Sustainable Peace: A New Research Agenda for Post-Conflict Natural Resource Management*. *Global Environmental Politics* 17(4): 1-8.
- Kupchan, Charles A. 2010. *How Enemies Become Friends: The Sources of Stable Peace*. Princeton: Princeton University Press.
- Lejano, Raul. 2006. *Theorizing Peace Parks: Two Models of Collective Action*. *Journal of Peace Research* 43(5): 563-581.
- 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.
- López, Alexander. 2004. *Environmental Conflicts and Regional Cooperation in the Lempa River Basin: The Role of Central America's Plan Trifinio*. Berlin: adelphi.
- Marshall, Monty G., Keith Jagers and Ted Robert Gurr. 2016. *Polity Iv Project: Political Regime Characteristics and Transitions, 1800-2015, Dataset Users' Manual*. Fort Collins: CSP.
- 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): 621-635.
- 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): 151-175.
- 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.

- Ovodenko, Alexander. 2014. *Regional Water Cooperation: Creating Incentives for Integrated Management*. Journal of Conflict Resolution 60(6): 1071-1098.
- Ovodenko, Alexander. 2016. *Governing Oligopolies: Global Regimes and Market Structure* Global Environmental Politics 16(3): 106-126.
- Palmer, Glenn, Vito D'Orazio, Michael Kenwick and Matthew Lane. 2015. *The Mid4 Dataset, 2002–2010: Procedures, Coding Rules and Description*. Conflict Management and Peace Science 32(2): 222-242.
- Petersen-Perlman, Jacob D., Jennifer C. Veilleux and Aaron T. Wolf. 2017. *International Water Conflict and Cooperation: Challenges and Opportunities*. Water International 42(2): 105-120.
- Rasler, Karen, William R. Thompson and Sumit Ganguly. 2013. *How Rivalries End*. Philadelphia: University of Pennsylvania Press.
- 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): 701-719.
- Sadoff, Claudia W. and David Grey. 2002. *Beyond the River: The Benefits of Cooperation on International Rivers*. Water Policy 4(5): 389-403.
- Sakaguchi, Kendra, Anil Varughese and Graeme Auld. 2017. *Climate Wars? A Systematic Review of Empirical Analyses on the Links between Climate Change and Violent Conflict*. International Studies Review 19(4): 622-645.
- 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 Kibaroglu, Aysegül and Ronald Jaubert (eds.), 125-137. Geneva: GIIDS.
- Selby, Jan. 2013. *Cooperation, Domination and Colonisation: The Israeli-Palestinian Joint Water Committee*. Water Alternatives 6(1): 1-24.
- Seter, Hanne, Ole Magnus Theisen and Janpeter Schilling. 2018. *All About Water and Land? Resource-Related Conflicts in East and West Africa Revisited*. Geojournal 83(1): 169-187.
- Swain, Ashok. 2002. Environmental Cooperation in South Asia. In *Environmental Peacemaking*, edited by Conca, Ken and Geoffrey Dabelko (eds.), 61-85. Baltimore: John Hopkins University Press.
- Thompson, William R. and David R. Dreyer. 2010. *Handbook of International Rivalries: 1494-2010*. Los Angeles: CQ Press.
- Tranholm-Mikkelsen, Jeppe. 1991. *Neo-Functionalism: Obstinate or Obsolete? A Reappraisal in the Light of the New Dynamism of the Ec*. Millennium 20(1): 1-22.
- Turton, Anthony. 2003. The Hydropolitical Dynamics of Cooperation in Southern Africa: A Strategic Perspective on Institutional Development in International River Basins. In *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin*, edited by Turton, Anthony, Peter Ashton and Eugene Cloete (eds.), 83-103. Pretoria: AWIR.
- UNEP. 2018. Unep and Environmental Peacebuilding. <http://drustage.unep.org/disastersandconflicts/what-we-do/recovery/environmental-cooperation-peacebuilding/unep-and-environmental-peacebuilding> (10/05/2018).
- Weinthal, Erika. 2004. *From Environmental Peacemaking to Environmental Peacekeeping*. Environmental Change and Security Project Report 10(1): 19-23.
- Williams, Philippa and Fiona McConnell. 2011. *Critical Geographies of Peace*. Antipode 43(4): 927-931.
- Wolf, Aaron T., Shira B. Yoffe and Mark Giordano. 2003. *International Waters: Identifying Basins at Risk*. Water Policy 5(1): 29-60.
- Yoffe, Shira B. and Kelli Larson. 2001. Water Event Database Methodology. In *Basins at Risk: Conflict and Cooperation over International Freshwater Resources*, edited by Yoffe, Shira B. (ed.), 13-59. Corvallis: Oregon State University.

- Young, Oran R. 2016. *On Environmental Governance: Sustainability, Efficiency, and Equity*. London: Routledge.
- Zeitoun, Mark and Naho Mirumachi. 2008. *Transboundary Water Interaction I: Reconsidering Conflict and Cooperation*. *International Environmental Agreements* 8(4): 297-316.
- Zikos, Dimitrios, Alevgul H. Sorman and Marissa Lau. 2015. *Beyond Water Security: Asecritisation and Identity in Cyprus*. *International Environmental Agreements* 15(3): 309-326.

**Table 1: Summary of the peace scale (adapted from Goertz et al. 2016: 25-46)**

<b>Value</b>	<b>Term</b>	<b>Indicators</b>	<b>Example</b>
0	severe rivalry	<ul style="list-style-type: none"> <li>- many disagreements</li> <li>- key issues unresolved</li> <li>- frequent military encounters</li> <li>- preparation for future wars</li> <li>- diplomatic hostility</li> </ul>	India-Pakistan (1947-2006)
0.25	lesser rivalry	<ul style="list-style-type: none"> <li>- several disagreements</li> <li>- key issues unresolved</li> <li>- isolated military encounters</li> <li>- preparation for future wars</li> <li>- diplomatic hostility</li> </ul>	Colombia-Venezuela (1841-1982)
0.5	negative peace	<ul style="list-style-type: none"> <li>- some disagreements</li> <li>- key issues are mitigated or resolved</li> <li>- no military encounters</li> <li>- preparation for future conflicts</li> <li>- diplomatic recognition and intergovernmental cooperation</li> </ul>	Egypt-Israel (1989-2006)
0.75	warm peace	<ul style="list-style-type: none"> <li>- few disagreements</li> <li>- key issues resolved</li> <li>- no military encounters</li> <li>- transnational ties</li> <li>- diplomatic relations and intergovernmental cooperation</li> </ul>	Argentina-Brazil (1986-2006)
1	security community	<ul style="list-style-type: none"> <li>- few disagreements</li> <li>- key issues resolved</li> <li>- joint military planning</li> <li>- transnational ties</li> <li>- functional integration and institutionalised cooperation</li> </ul>	France-Germany (1992-2006)

**Table 2: Logistic regression analysis**

Variable	(1)	(2)	(3)	(4)
Log. nbr. pos. WaRI (10 years)		0.0899 (0.0461) +	0.3237 (0.0723) **	-0.0763 (0.0666)
Number of IGOs t-1	0.0002(0.000) **	0.0002(0.000) **	0.0000 (0.0001)	0.0004 (0.0002) *
Democracies	0.0153 (0.0053) **	0.0156 (0.0054) **	0.0374 (0.0052) **	-0.0237 (0.0101) *
Interstate conflict	0.6592 (0.2842) *	0.6270 (0.2916) *	-14.7225 (0.3419) **	0.3520 (0.2821)
Peace years	-0.0377 (0.0076) **	-0.0369 (0.0076) **	-0.0096 (0.0097)	-0.0371 (0.0183) *
Peace years sq.	1.072 (0.1702) **	1.0622 (0.17) **	3.0559 (0.4824) **	0.6405 (0.2771) *
Rel. military capacities	-0.0001(0.000)	0.0000 (0.000)	0.0014 (0.0004) **	0.0001 (0.0024)
Systemic shock	1.1293 (0.1775) **	1.1634 (0.1817) **	2.3621 (0.257) **	0.4354 (0.2301) +
Time trend	0.0108 (0.0059) +	0.0090 (0.0059)	-0.0060 (0.0079)	0.0615 (0.0118) **
Constant	-5.5180 (0.2902) **	-5.3869 (0.2864) **	-8.8819 (0.5212) **	-5.0292 (0.4556) **
Number of observations	14981	14981	12099	2882
Log likelihood	-948.21	-945.97	-309.97	-468.5
AUC	0.74	0.74	0.92	0.69

DV= Probability of shift towards more peaceful interstate relations. Clustered standard errors in parentheses. Significance codes: \*\* p<0.01, \* p<0.05, + P<0.10

**Table 3: Robustness checks**

Variable	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log. nbr. pos. WaRI (10 years)						0.1026 (0.0496) *	0.0910 (0.0419) *	0.0899 (0.0419) *
Log. nbr. pos. WaRI (2 years)	0.0853 (0.061)							
Log. nbr. pos. WaRI (5 years)		0.0609 (0.052)						
Log. nbr. pos. WaRI (8 years)			0.0447 (0.0495)					
Log. nbr. high. pos. WaRI (10 years)				0.0780 (0.0514)				
Log. sum WaRI scores (10 years)					0.0362 (0.0235)			
Number of IGOs t-1	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **	0.0002 (0.0000) **
Log. trade (10 years)						0.1128 (0.0356) **		
Democracies	0.0155 (0.0053) **	0.0155 (0.0053) **	0.0155 (0.0053) **	0.0155 (0.0054) **	0.0156 (0.0054) **		0.0162 (0.0052) **	0.0156 (0.0052) **
Interstate conflict	0.6267 (0.2921) *	0.6371 (0.2897) *	0.6446 (0.2883) *	0.6451 (0.2889) *	0.6418 (0.288) *	0.1305 (0.4126)	0.6494 (0.2883) *	0.6270 (0.2883) *
Peace years	-0.0371 (0.0076) **	-0.0371 (0.0076) **	-0.0373 (0.0076) **	-0.0375 (0.0076) **	-0.0373 (0.0076) **	-0.0401 (0.0081) **	-0.0375 (0.0068) **	-0.0369 (0.0069) **
Peace years sq.	1.0685 (0.1693) **	1.0699 (0.1694) **	1.0682 (0.1703) **	1.0619 (0.1708) **	1.0613 (0.1705) **	0.9826 (0.2055) **	1.0546 (0.1763) **	1.0622 (0.1763) **
Rel. military capacities	-0.0001(0.0006)	-0.0001(0.0006)	-0.0001(0.0006)	0.0000 (0.0006)	0.0000 (0.0006)	-0.0010 (0.0013)	0.0008 (0.0009)	0.0000 (0.0009)
Systemic shock	1.1242 (0.1781) **	1.1368 (0.1792) **	1.1417 (0.1794) **	1.1583 (0.181) **	1.1598 (0.1814) **	0.9903 (0.2257) **	1.1692 (0.1781) **	1.1634 (0.1781) **
Time trend	0.0098 (0.0059) .	0.0099 (0.0059) .	0.0100 (0.0059) .	0.0101 (0.0058) .	0.0097 (0.0059) .	0.0131 (0.0079) .	0.0086 (0.0065)	0.0090 (0.0065)
Constant	-5.3382 (0.2975) **	-5.4112 (0.2928) **	-5.4464 (0.2899) **	-5.3989 (0.2856) **	-5.4205 (0.2855) **	-5.4191 (0.4239) **	-5.3754 (0.3095) **	-5.3869 (0.3096) **
Number of observations	14981	14981	14981	14981	14981	10605	14981	14981
Log likelihood	-947.22	-947.42	-947.71	-947.03	-946.93	-633.18		-945.97
AUC	0.74	0.74	0.74	0.74	0.74	0.76	0.74	0.74
Rare event correction	-	-	-	-	-	-	yes	-
Random effects	-	-	-	-	-	-	-	Yes

DV= Probability of shift towards more peaceful interstate relations. Clustered standard errors in parentheses. Significance codes: \*\* p<0.01, \* p<0.05, + P<0.10

