



Research paper

Assessment of transboundary river basins for potential hydro-political tensions

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ABSTRACT

This paper presents a systematic, global assessment of transboundary watersheds that identifies regions more likely to experience hydro-political tensions over the next decade and beyond based upon environmental, political, and economic indicators. The development of new water infrastructure in transboundary basins can strain relationships among fellow riparians as the impacts of new dams and diversions are felt across borders. Formal arrangements governing transboundary river basins, such as international water treaties and river basin organizations, provide a framework for dialogue and negotiation, thus contributing to assuaging potential disputes. Our study examines these two issues in tandem – the stresses inherent in development and the mitigating impact of institutions – and maps the risk of potential hydro-political tensions that exist where basins may be ill-equipped to deal with transboundary disputes triggered by the construction of new dams and diversions. We also consider several factors that could exacerbate those hydropolitical tensions in the near future, including changes in terrestrial water storage, projected changes in water variability, per capita gross national income, domestic and international armed conflicts, and recent history of disputes over transboundary waters. The study points to the vulnerability of several basins in Southeast Asia, South Asia, Central America, the northern part of the South American continent, the southern Balkans as well as in different parts of Africa, where new water infrastructure is being built or planned, but formal transboundary arrangements are absent. Moreover, in some of these regions there is a concomitance of several political, environmental and socio-economic factors that could exacerbate hydropolitical tensions. This study contributes to the understanding of how the recent proliferation of development accompanied with unfavourable socio-economic and environmental indicators may influence global hydropolitical resilience.

1. Introduction

Anticipating where tensions or conflicts over transboundary waters may arise or escalate in the short- or mid-term is key to guide policy interventions and focus capacity-building efforts where they are more needed. The search for hotspots of hydropolitical tension can be framed as an assessment of “hydropolitical vulnerability”, which is associated with the risk of political dispute over shared water systems (Wolf, 2007).

Identifying areas of potential transboundary tensions first requires understanding the nature and frequency of past disputes, through in-depth case studies and global or regional inventories of instances of conflict and cooperation. The first attempt to provide a global overview of interactions over water between riparian countries produced the

International Water Event Database (IWED, Wolf et al., 2003b; De Stefano et al., 2010), which reports cooperative and conflictive interactions over diverse water issues for the period 1948–2008. The International River Basin Conflict and Cooperation (IRCC), developed by Kalbhenn and Bernauer (2012), utilizes an approach similar to the IWED by using a modified coding system and covers the period 1997–2007. Finally, the Issue Correlates of War – River Claims dataset records explicit contention between two or more nation-states over the use or abuse of a specific river for the period 1900–2001 in the Western Hemisphere, Northern and Western Europe, and the Middle East (Hensel et al., 2008). These inventories provide global overview of transboundary tensions and cooperation, but as any global dataset, provide a simplified picture of the complex reality of disputes. Starting from the idea that the “the absence of war does not mean the absence of

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conflict” (Zeitoun and Warner, 2006), Zeitoun and Mirumachi (2008) proposed a two-dimensional matrix to classify interactions (Transboundary Waters Interaction Nexus) that underscores the dual nature of interactions (conflict and cooperation) over transboundary waters, and applied it to a selected number of basins. Similarly, Watson (2015) cites Galtung (1969) to distinguish between “negative peace”, meant as the absence of physical, direct violence, and “positive peace”, defined as the absence of structural violence. Based on this important distinction and the experience of Wolf et al. (2003b), Watson (2015) builds and tests in the Mekong basin a coding system (Integrated Basins at Risk, IBAR) that considers also inequalities and injustices within the basin.

In parallel to the development of these inventories, many authors have explored what can contribute to conflict in transboundary basins, considering issues such as the saliency of the river (Hensel et al., 2008); water availability (e.g. Tøset et al., 2000; Furlong et al., 2006; Gleditsch et al., 2006); climate change (Nordås and Gleditsch, 2007; Gleditsch, 2012); peacefulness of riparian relationships (Brochmann and Gleditsch, 2012); level of democracy (Brochmann and Hensel, 2009; Brochmann and Gleditsch, 2012); commercial trade (Espey and Towfique, 2004; Brochmann and Hensel, 2009; Tir and Ackerman, 2009; Dinar et al., 2015); upstream-downstream relationships (Munia et al., 2016); the existence of transboundary treaties (Brochmann, 2012; Wolf et al., 2003a; Tir and Stinnett, 2012) or the specific design of international water agreements (Dinar et al., 2015). These studies use theoretical arguments or historical evidence to establish causal links between conflicts and factors potentially conducive to tensions over water, which is the first but necessary step to identify of future potential tensions.

Forward-looking analyses of international river basin conflict and cooperation at a global scale are limited in number and challenging, both methodologically and in terms of data availability. The TFDD Basins at Risk (BAR) project undertook for the first time a systematic global study of the causes of water conflict and identified in a qualitative way 29 basins to be at potential risk of conflict (Wolf et al., 2003b). More recently Bernauer and Böhmelt (2014), applied prediction and forecasting methods to identify river basins that are prone to conflict or cooperation. Finally, De Stefano et al. (2012) identified transboundary basins at risk of hydropolitical tension stemming from the combination of low institutional resilience to water variability with high historic or projected variability regimes due to climate change.

This paper aims to contribute those type of analyses by identifying international basins that could experience hydropolitical tensions due to the stress associated with the construction of dams and water diversions and exacerbated by other contextual factors. Our approach includes: a) A method for determining areas of potential risk of future dispute by mapping new or planned water infrastructure development and examining formal institutional capacity in these locations; and b) Integration of additional environmental, political, and economic indicators known to increase tensions in transboundary basins. Our results identify which regions and basins are most likely to experience hydropolitical disputes, and may be used to focus more in-depth analysis in potential hotspots and to inform efforts aimed at mitigating potential water conflicts between riparian nations.

2. River basin development and institutional resilience

In the context of transboundary relations, past research suggests that the most indicative variables for conflict reflect rapid or extreme change to physical or institutional systems within a basin in absence of transboundary institutional mechanisms able to manage the effects of that change (Wolf et al., 2003b).

Dams and water infrastructure help manage water variability – providing water in times of drought or dampening the effects of floods – but can also substantially change the hydrological function of the

basin where they are built. Thus dams and water infrastructure can become significant sources of transboundary water disputes, from when they are first conceived until the end of their life cycle (Yoffe et al., 2003; De Stefano et al., 2010; Gleick 1993; Eckstein 1995; Eshchanov et al., 2011; Gleick and Heberger 2013). After a slowdown in the 1990s, the world has recently seen a resurgence in new water development, and many opportunities for this development lay in transboundary river basins (McCartney, 2007; Wang et al., 2014). These new developments underscore the policy relevance of mapping and monitoring where new dams and water diversions are being built or are planned.

The construction of large dams in upstream riparians without an agreement in place was found to be one of the strongest indicators of a basin's potential hydropolitical tension (Wolf et al., 2003b). This is evident in the Nile Basin, where the government of Ethiopia's construction of the Grand Ethiopian Renaissance Dam has been occurring without an agreement with downstream Egypt. News of its construction was greeted within Egypt by violent protests and strong rhetoric from Egyptian politicians (Gebreluel, 2014). At the same time, dams built with mechanisms for benefit-sharing between riparian nations can be positive for cooperation (Gryzbowski et al., 2009). However, conflict and lengthy renegotiations may occur at a later stage if negative environmental and social effects of these dams are neglected in initial cooperative frameworks (Hensengerth et al., 2012).

Building institutional capacity, in the form of treaties and river basin organizations, is considered to contribute to the decrease of the likelihood of hydropolitical conflict (Wolf et al., 2003a,b; Yoffe et al., 2004; De Stefano et al., 2012; Tir and Stinnett, 2012; Brochmann, 2012). Moreover, transboundary water agreements can include mechanisms like flow variability or data sharing provisions (Gerlak et al., 2011) that reduce uncertainty and increase flexibility, thus boosting the overall adaptive capacity of the basin (Milman et al., 2013). Yet, the mere presence of treaties does not necessarily indicate hydropolitical resilience (Zeitoun and Warner, 2006), nor does the presence of agreements preclude the absence of conflict. Inherent weaknesses of certain consent-building relations in water also exist. For example, riparians can exploit treaties because they are not easily enforceable or are structured to reflect (or exacerbate) existing inequalities between riparians, which leads to non-signatory riparians not participating (Zeitoun and Warner, 2006). A rich literature critical of the presumed relationship between treaties and cooperation has developed led by the London Water Research Group. Members of which have made the important case that treaties can not only solidify power imbalances between actors, but they can lock out public participation, and may even be a source of conflict themselves (see, for example Zeitoun and Mirumachi, 2008; Zeitoun et al., 2011). It may also be the parties engaged in cooperation, rather than the treaty or institution's content or presence, which may be at the heart of a successful agreement (Chasek et al., 2006). Treaty presence may also falsely imply the degree to which transboundary waters are effectively managed (Zawahri, 2008). In Africa, of the 153 agreements identified by Lautze and Giordano (2005), only 108 were considered substantive regarding transboundary water resources issues, while others were either never implemented in practice or are no longer enforced.

While the presence of a treaty is no guarantee of constructive relations and a number of circumstances have been found to contribute transboundary cooperation (Varady et al., 2013), treaties can provide a starting point for dialogue among riparians (Tir and Stinnett, 2012). Significantly, the “proportion of transboundary basin area with an operational arrangement for water cooperation” (Indicator 6.5.2) is being discussed to be an indicator of the achievement of the Sustainable Development Goal Target 6.5 (“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate”). While the methodology for measuring this indicator is still being developed (UN-Water, 2016), it is clear both that treaties and River Basin Organizations (RBOs) will be a central stage of transboundary cooperation. Institutional capacity in a basin is

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