Metadata Sheet: Hydropolitical Tension: Risk of Potential Hydro-political Tensions due to Basin Development in Absence of Adequate Institutional Capacity (Indicator No. 11)

Title:	**Hydropolitical Tension: Risk of Potential Hydro-political Tensions due to Basin Development in Absence of Adequate Institutional Capacity**
Indicator Number:	*11*
Thematic Group:	*Governance*
Rationale:	Formal management institutions governing transboundary river basins, in the form of international water treaties (including specific provisions such as water allocation, conflict resolution, and variability management) and river basin organizations, can be particularly instrumental in managing disputes among fellow riparians arising from the development of new water infrastructure. This Indicator maps risk of potential hydro-political tension that exists when basins may be ill-equipped to deal with transboundary disputes associated to the development of new water infrastructure. The results of this indicator are based on the estimation of institutional vulnerability (expressed by absence of relevant treaty provisions and river basins organizations), which is juxtaposed with the respective basin's ongoing and planned development of water infrastructure.
Interlinkages:	GW (indication of the level of formal transboundary cooperation in aquifers overlapping within transboundary basins), Lakes (results likely to be similar for lakes overlapping with transboundary river basins)
Description:	Combination of institutional vulnerability level, based on formal institutional capacity, and hazard level, calculated based on the development of on-going and planned water infrastructure.
Metrics:	▪ Categorization of international water treaties – 2010 data calculated by Oregon State University (De Stefano*, et al.,* 2012; Giordano et al., 2013). Based on 796 basin-country units from 286 transboundary river basins. ▪ Data on existence of river basin organization (RBO) in basins – data hosted by Oregon State University (Schmeier, no date). ▪ Data on new water infrastructure in basins, whose construction is ongoing or planned. Data source: Petersen-Perlman (2014), based on the United Nations Framework Convention on Climate Change's Clean Development Mechanism projects (http://cdm.unfccc.int), International Rivers Network, and other organizations' websites known to fund or catalog dam and water diversion construction (e.g., World Bank) ▪ Weighting of Basin-Country Unit (BCU) values based on share of BCU population in basin. Population values are taken from GPW v.3, 2010 projection http://sedac.ciesin.columbia.edu/data/set/gpw-v3-population-density-future-estimates (CIESIN, 2005). ▪ Weighting of BCU scores based on area – the share of BCU area in relation to basin area.
Computation:	The computation of Hydropolitical Tension indicator scores required following steps of computation at a BCU level: 1. Calculation of the institutional resilience score, which expresses the capacity of each BCU to deal with tension associated with new dam and water diversion development, by recording five components of formal transboundary cooperation (Table 1). These components are then combined to create the treaty-RBO score. One point is given to a BCU for each treaty

and RBO component present in that BCU, resulting in a treaty-RBO resilience score ranging from zero to five. The definitions and data for this step of the computation were obtained from De Stefano et al. (2012) and complemented with data on the existence of additional conflict resolution mechanisms embedded in international RBOs using data from OSU (Schmeier, no date).

Treaty-RBO component	Possible value
At least one water treaty. *A treaty is meant as a formal agreement between sovereign nation-states substantively referring to water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained (Hamner & Wolf, 1998). Geographic scope must be specific enough to identify that, at minimum, the treaty applies to all waters shared between signatories*	0/1
At least one treaty with an allocation mechanism, *for allocating water for water quantity and/or hydropower uses*	0/1
At least one treaty with a flow variability management mechanism, *for facing flood and/or drought events or other specific variation in flow*	0/1
At least one treaty with a conflict resolution mechanism¸ *i.e. mechanisms specified to address disagreements among the signatories, including arbitration, diplomatic channels, a commission, third-party involvement, and/or a permanent judicial organ*	0/1
At least one river basin organization, *meant as a bilateral or multilateral body of officials representing participating governments in dialogue about coordinated management of international water bodies.*	0/1
Total possible value for a basin-country unit	**0 to 5**

Table 1

2. The BCU score obtained in step 1 was then grouped into three institutional vulnerability levels for each BCU, with 'low' representing a treaty-RBO score of four or five, 'medium' representing a score of two or three, and 'high' representing a score of zero or one (Table 2).

Treaty-RBO value	Vulnerability score
4, 5	1 – LOW V
2, 3	2 – MED V
0, 1	3 – HIGH V

Table 2

3. The estimate of potential tension due to new water infrastructure development was calculated by gathering information regarding dams (exceeding 10 MW in capacity) and diversion projects diverting quantities greater than 100,000 m^3 that are planned, proposed, and under construction. A number of sources were used to build the dataset: the United Nations Framework Convention on Climate Change's Clean Development

Mechanism (http://cdm.unfccc.int), International Rivers Network, the International Commission on Large Dams (ICOLD), and other organizations' websites known to fund infrastructure construction (e.g., World Bank). The analysis also considered that new dams or diversions may bring impacts to BCUs located downstream of that infrastructure. For dams constructed on a river segment that serves as the border between riparian countries, both BCUs received a score indicating the presence of a dam. Ultimately, the BCUs were labeled high hazard (H) if there is a presence or they are downstream of a presence of a water infrastructure development project, and low hazard (H) if there is no presence of such developments (Table 3).

Water Developments (Large Dam and Water Diversion Projects)	**Score ("hazard")**
No presence (in the BCU or upstream of it)	1 - LOW
Presence (in the BCU or upstream of it)	3 - HIGH

Table 3

4. The vulnerability values obtained in step 2 were multiplied with the hazard values calculated in step 3 as shown in Table 4.

Vuln↓/ Haz→	1 - LOW		3 - HIGH
1 (low V)	1		3
2 (med V)	2		6
3 (high V)	3		9

Table 4

5. The values obtained in step 4 were grouped into 5 categories (Table 5). The resulting values represent the **risk of potential hydro-political tensions due to basin development in absence of institutional capacity at a BCU level**.

Risk scores from Table 4	Risk categories
1	1 –Very low risk
2	2
3	3
6	4
9	5 – Very high risk

Table 5

6. To obtain aggregated values by basin, a weighted BCU score was calculated for each BCU by calculating the average of the BCU area and population weighting in basin. The resulting BCU weight is then multiplied by the baseline indicator value (step 5) for each BCU.
7. To obtain a basin indictor score, the values of the respective BCUs were

summed up.

8. The resulting basin scores were grouped into 5 relative risk categories (Table 6). The resulting basin indicator scores represent the **risk of potential hydro-political tensions due to basin development in absence of institutional capacity at a basin level**.

Risk score	Relative risk category
1.00-1.50	1 – Very low risk
1.51-2.50	2
2.51-3.50	3
3.51-4.50	4
4.51-5.00	5 – Very high risk

Table 6

Units: *Unitless, relative risk categories*

Risk categorization

Basins with lower scores have lower levels of potential hydro-political tension due to basin development in absence of institutional capacity.

Table below presents and overview of the indicator results.

Relative risk category	Basin Risk Score	No. of Basins	Proportion of Basins	No. of BCUs	Proportion of BCUs
1 - Very low	1.00-1.50	40 (0*)	14%	116 (0*)	15%
2 - Low	1.51-2.50	50 (0*)	17%	138 (0*)	17%
3 - Moderate	2.51-3.50	160 (0*)	56%	452 (0*)	57%
4 - High	3.51-4.50	14 (0*)	5%	40 (0*)	5%
5 - Very high	4.51-5.00	22 (0*)	8%	50 (0*)	6%

* Number of basins/BCUs for which results have been calculated, but bear a lower level of confidence due to modeling/methodological limitations

Limitations:

The Hydropolitical Tension indicator is based on the identification of key institutional components that are directly related to the management of water variability in transboundary basins. These elements were selected based on the extant literature and are also based on the availability of data to map them at a global scale (see De Stefano et al., 2012 and Petersen-Perlman (2014) for a detailed justification of the selection). As with any global indicator, however, they represent a simplification of the large number of factors that could have an impact on hydropolitical tension.

Moreover, this indicator considers only the *existence* of specific institutional components and does not assess the level of implementation or performance of these components in practice.

Dam and diversion project data are based on publicly available information only. This means that there could be additional water infrastructure projects that were not found during the data search, for where information is not up to date or is not publicly available. Also the status of these projects is rapidly changing – some of these projects may have been canceled or completed since the last updates of the respective databases.

Spatial Extent: Global

Spatial Resolution:	BCU, basin
Year of Publication:	NA
Time Period:	NA
Additional Notes:	**Cited references** De Stefano L., Duncan J., Dinar S., Stahl K., Strzepek K M. and A. T. Wolf (2012). Climate change and the institutional resilience of international river basins. Journal of Peace Research. 49(1):193-209. Petersen-Perlman, J.D. (2014). Mechanisms of cooperation for states' construction of large-scale water infrastructure in transboundary river basins. Ph.D. Dissertation, Oregon State University, USA. Giordano, M.; Drieschova, A.; Duncan, J.A.; Sayama, Y.; De Stefano, L. & A. T. Wolf (2013) A review of the evolution and state of transboundary freshwater treaties Center for International Earth Science Information Network - CIESIN - Columbia University, and Centro Internacional de Agricultura Tropical - CIAT. (2005). Gridded Population of the World, Version 3 (GPWv3): Population Density Grid, Future Estimates. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H4ST7MRB. Accessed 24 July 2014. Schmeier, Susanne (no date): International RBO Database, Transboundary Freshwater Dispute Database (TFDD), Corvallis, OR: Oregon State University http://www.transboundarywaters.orst.edu/research/RBO/RBO_Database.html, accessed 27 Jul 2014
Date:	01-02-2015
Format:	Excel file
File Name:	TWAP_RB_metadata_Ind_11_HydropolTens.xlsx
Contact person:	Lucia De Stefano and James Eynard, Oregon State University
Contact details:	luciads@geo.ucm.es; jimeynard@gmail.com