Metadata Sheet: Lake Influence Indicator
(Water System Linkages)

Title:	***Lake influence per transboundary river basin***
Indicator Number:	**Interlinkage indicator #2**
Cluster:	**Water System Interlinkages**
Rationale:	*The Lake Influence Indicator is a link between the River Basins component and the Lake Basins component of the TWAP project. The main objective of the indicator is to provide information about the buffering and storage capacity of lakes within transboundary river basins. In contrast to the flowing waters of rivers, lakes store water and release it slowly or when required. Hence, managed or unmanaged levels of lake storage provide flood protection and alleviate water shortages for residential, commercial, industrial and agricultural uses downstream. Furthermore, lakes influence water quality, including the dynamics of pollutants and nutrients in the water column. For example, because of their large water volumes and long water residence times, the natural buffering capacity of lakes can neutralize or otherwise remove pollutants entering them. At a certain point, however, the buffering capacity of a lake can be exhausted or overwhelmed, with the lake subsequently becoming a source of pollution for downstream rivers until the pollutants contained in it are flushed out or otherwise neutralized.*
Interlinkages:	*Lakes: Lakes and rivers are strongly interrelated. The buffering capacity of lakes affects water quantity and quality issues within a river basin.*
Description:	Storage capacity of all lakes in a river basin divided by annual water availability in the river basin.
Metrics:	• Lake storage capacity has been collected from different available data sources (Global Lake Database, Global Lake and River Ice Phenology Database, World Lake Database, Lake Model FLake, Wikipedia and single papers/ studies). If data for lake volume were not available, it has been computed by means of lake area and mean depth (Lake volume V = Lake Area A * Lake mean depth d). In case no information on either lake volume or depth was available, lake volume is estimated according to Ryanzhin 2005. All lakes of the Global Lakes and Wetland Database Level 1 (GLWD1) are considered for this indicator. • Mean annual renewable water availability (taking into account human impacts such as water use and dam management) for the time period 1971-2000 computed by CESR at 30 min. grid using the Global Hydrology model WaterGAP2.2 (Müller Schmied et al. 2014). The meteorological data from WATCH (WFD, Weedon et al. 2011) are used to drive the model. Water consumption, which is subtracted from the natural water availability, is calculated by the Global Water Use sub-models of WaterGAP2.2, made up of: – Domestic demand (Flörke et al. 2013); – Thermal electricity production demand (Flörke et al. 2013); – Manufacturing industry demand (Flörke et al. 2013); – Agricultural demand (Alcamo et al. 2003, aus der Beek et al. 2010, Döll and Siebert 2002); and – Area equipped for irrigation (GMIAv5, Siebert et al. 2013).
Computation:	Calculation of indicator:

	1. Storage capacity of all lakes is determined 2. Storage capacity of all lakes in the same river basin is summed per basin 3. Mean annual renewable water availability (including human impacts such as water consumption and dam management) is calculated per river basin 4. Storage capacity of all lakes within the basin (2.) is divided by mean annual water availability in the basin (3.)
Units:	[%], i.e. the percentage of annual river discharge that can be stored in the available lakes within a river basin
Scoring system:	No risk categories are applied for this indicator as this indicator provides additional information to the selected indicators in TWAP. That is, the lake influence indicator shows the buffering capacity in each river basin which need to be related to the water quantity and quality conditions in the river basin.
Limitations:	▪ Storage capacity is a steady state value not available for all lakes. ▪ There is no boundary condition for defining an acceptable vs. unacceptable storage volume as it relates to either lake or river condition.
Spatial Extent:	Global (for all transboundary river basins)
Spatial Resolution:	Lakes and Wetlands Database Level 1 (GLWD1) Hydrology and water use at 0.5° grid cells
Year of Publication:	GLWD (Lehner & Döll, 2004) WaterGAP2.2 (Müller Schmied et al. 2014)
Time Period:	1971-2000
Additional Notes:	
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