Metadata Sheet: Wastewater Pollution
(Indicator No. 5)

Title:	***Wastewater Pollution***
Indicator Number:	*5*
Thematic Group:	*Water Quality*
Rationale:	Untreated wastewater from human activities is one of the major threats to water quality and human health today. After use for domestic and commercial purposes, and industrial activities, water often contains remains of the respective activity – e.g. nutrients, chemical residues and other pollutants. Untreated wastewater can threaten human health, lead to algal blooms and eutrophication (which can lead to fish die-off due to lack of oxygen). With rapidly expanding cities, often without adequate sanitation services and regulatory frameworks to control this pollution, wastewater is a significant problem in many parts of the world.
Interlinkages:	*GW (contaminated recharge), Lakes (contamination, eutrophication), LMEs (quality of water), OO (persistent pollutants)*
Description:	The Wastewater Pollution indicator measures the estimated levels of wastewater treatment in Basin Country Units (based on national data), rather than absolute volumes of wastewater polluting waterways. This gives an indication of the risks from pathogens which may be highly relevant to vulnerable populations at local scales, and the aggregated scores give an indication of threats stemming from poor wastewater treatment performance on a basin level. This indicator is largely based on data and methodology from the Wastewater Treatment Performance indicator developed by the EPI (Environmental Performance Index) team at The Yale Center for Environmental Law & Policy (Malik et al. 2015). This indicator compiles wastewater treatment statistics for 183 countries and was deemed to be the most comprehensive, up to date data source available.
Metrics:	1. EPI Wastewater Treatment Performance Indicator (national level data) Based on two metrics: wastewater treatment and connection rate (Malik et al. A global indicator of wastewater treatment to inform the Sustainable Development Goals (SDGs), Environmental Science & Policy, Volume 48, April 2015, Pages 172–185). Wastewater is defined as "water that has been used by households, industries, and commercial establishments that, unless treated, no longer serves a useful purpose and may contain contaminants" The EPI Wastewater Treatment Performance indicator is based on two variables: a) wastewater treatment - the amount of wastewater that is treated within a country relative to the amount of wastewater that is collected, generated, or produced; b) connection rate – the population connected to municipal sewerage systems relative to the population living in the country. The indicator assesses national wastewater treatment performance, normalizing treatment scores by the population connected to municipal sewerage systems, using following calculation: wastewater treatment level x connection rate Underlying data sources: - Pinsent Masons Water Yearbook (2013) - United Nations Statistics Division (2011)

	- OECD (2013) - FAO (2013) - National level data gap-filled from reports and on national statistics websites 2. <u>Weighted BCU scores based on population and area</u> Population data from GPW v.3 2010 future estimates, from CIESIN; area data from TWAP River Basins and BCUs shapefile.

Computation:	The scores for TWAP RB Wastewater Pollution indicator were calculated following these steps:
	    1. The national EPI wastewater treatment performance scores were assigned to the corresponding BCUs of the transboundary basins (for the purposes of the Wastewater Treatment indicator, these scores were inverted, i.e. Wastewater pollution = (1 – wastewater treatment score)).
	    2. These BCU scores were multiplied by the BCU weights to give weighted BCU scores, where the BCU weights were calculated based on the population in the BCU relative to the basin, given that population (as opposed to area), is the most significant driver in this dataset.
	    3. Weighted BCU scores were then added to provide basin scores
	    4. Risk categories were assigned

Units:	Unitless
Scoring system:	Basin and BCU results were categorized using equal quintiles with highest raw scores representing 'high' risk, and vice versa – basins and BCUs with low low scores representing low risk to ecosystems and human health (thus high wastewater treatment performance). Results summary:

Relative risk category	Range (normalized score)	No. of Basins	Proportion of Basins	No. of BCUs	Proportion of BCUs
1 - Very low	0-0.2	25 (0*)	9%	98 (0*)	12%
2 - Low	0.2-0.4	37 (1*)	13%	75 (0*)	10%
3 - Moderate	0.4-0.6	19 (0*)	7%	37 (0*)	5%
4 - High	0.6-0.8	43 (0*)	15%	94 (0*)	12%
5 - Very high	0.8-1.0	160 (3*)	56%	472 (0*)	61%

* Number of basins/BCUs for which results have been calculated, but bear a lower level of scientific confidence

All basins with least 80% of the basin population represented by the BCUs with results were included in the assessment. This threshold was considered reasonable by the authors, after evaluating the data. Results for the 4 basins with between 80 and 99% of the population coverage were thus included but deemed to have a lower degree of confidence in results. The number of these basins across risk categories is indicated by * in the table above.

Limitations:	- Data are based on national level data, where available, thus regional in-country differences in wastewater treatment and collection might exist that have not been accounted for (e.g. larger cities vs smaller cities, better off vs poorer regions of same country) - Underlying EPI Wastewater Indicator data have been supported by gap-filling and some assumptions (see more in Malik et al, 2015). Specific limitations relating to the EPI Wastewater Indicator include: a) reporting definitions are inconsistent across countries;

	b) wastewater performance trends vary regionally, and by income; c) for countries where national level data not available, data have been gap-filled based on subnational statistical reports for major cities (i.e. rural wastewater treatment not taken into consideration, where not available), or utility-reported data; d) in some instances data gap-filled based on peer-reviewed academic literature for relevant wastewater treatment statistics or experts and government officials; e) National level data based on the most recent year available. For data with no record of year reported, the year was estimated based on the given data source; f) for some countries values are estimated based on available nominal descriptions
Spatial Extent:	Global
Spatial Resolution:	BCU and Basin level
Year of Publication:	2014
Time Period:	1990-2013 (national data based on the most recent year for which data is available)
Additional Notes:	Calculated based on data from EPI Wastewater indicator national scores: Omar A. Malik, Angel Hsu, Laura A. Johnson and Alex de Sherbinin, A global indicator of wastewater treatment to inform the Sustainable Development Goals (SDGs), in review
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