

Global Basin Risk Indicators - Descriptions, Sources and Links

Risk type	Risk category	#	Risk indicator	Description	Source	Link
Physical Risk	1. Quantity - Scarcity	1.0	Aridity	The data set provides further information about the potential availability of water in regions with low water demand and is used here to improve the risk indications for dessert and other arid areas. Aridity is usually expressed as a generalized function of precipitation, temperature and potential evapo-transpiration (PET). An Aridity Index (UNEP, 1997) can be used to quantify precipitation availability over atmospheric water demand.	Trabucco, A., and Zomer, R.J. 2009. Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial Database. CGIAR Consortium for Spatial Information. Published online, available from the CGIAR-CSI GeoPortal at: http://www.csi.cgiar.org .	http://www.cgiar-csi.org/data/global-aridity-and-pet-database
		1.1	Water depletion	The ratio of water consumption-to- availability (i.e., water depletion) is Moderate (dry-year depletion, where for at least 10% of the time, the monthly depletion ratio >75%), Significant (seasonal depletion, where for one month of the year on average, the depletion ratio is >75%), or Severe (ongoing depletion, where the depletion ratio on average is >75%)	Brauman, KA, BD Richter, S Postel, M Malby, M Flörke. (2016) "Water Depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments." Elementa: Science of the Anthropocene.	http://www.earthst.at.org/
		1.2	Baseline Water Stress	Baseline water stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. Higher values indicate more competition among users.	Sources: WRI Aqueduct 2014; FAO AQUASTAT 2008-2012; NASA GLDAS-2 2012; Shiklomanov and Rodda 2004; Flörke et al. 2012; Matsutomi et al. 2009	http://www.wri.org/resources/data-sets/aqueduct-global-maps-21-data
		1.3	FAO Water Stress	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources. This is the indicator informing SDG 6.4.2.	Food and Agriculture Organization of the United Nations (FAO) through AQUASTAT	https://unstats.un.org/sdgs/indicators/database/?indicator=6.4.2
		1.4	Projected change in water discharge (by ~2050)	This indicator is based on multi-model simulation that applies both climate and hydrological models. Simulated annual discharge was averaged over a 31-year period with 2°C mean warming. Results are expressed in terms of relative change (%) as compared to the scenario of no global warming.	ISIMIP; Global Climate Impacts: A Cross-Sector, Multi-Model Assessment Special Feature - Physical Sciences - Sustainability Science: Jacob Schewe et al 2013; Multimodel assessment of water scarcity under climate change PNAS 2014 111 (9) 3245-3250; published ahead of print December 16, 2013, doi:10.1073/pnas.1222460110	http://www.pnas.org/content/111/9/3245

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		1.5	Estimated occurrence of droughts (2014-2017)	Impact of drought in the last three years (May 2015 – May 2018) based on the SPEI drought indicator (Standardized Precipitation and Evaporation Index).	Vicente-Serrano S.M., Santiago Beguería, Juan I. López-Moreno, (2010) A Multi-scalar drought index sensitive to global warming: The Standardized Precipitation Evapotranspiration Index – SPEI. Journal of Climate 23: 1696-1718	http://sac.csic.es/sp ei/map/maps.html
		1.6	Projected change in occurrence of droughts (by ~2050)	This indicator is based on multi-model simulation that applies both climate and drought models. A drought threshold for pre-industrial conditions was calculated based on time-series averages. Results are expressed in terms of relative change (%) in probability between pre-industrial and 2°C scenarios.	ISIMIP - The Inter-Sectoral Impact Model Intercomparison Project ; Assessing the impacts of 1.5° C global warming - suimulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b).	www.isimip.org
	2. Quantity - Flooding	2.1	Estimated occurrence of floods	The indicator assesses the recurrence of large floods in a basin in the period 1987-2017.	G.R.Brakenridge, "Global Active Archive of Large Flood Events", Dartmouth Flood Observatory, University of Colorado, http://floodobservatory.colorado.edu/Archives/index.html	http://floodobservatory.colorado.edu/Archives/index.html
		2.2	Projected change in occurrence of floods (by ~2050)	This indicator is based on multi-model simulation that applies both climate and flooding models. The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Such flood event definition is then applied and results are expressed in terms of change in probability (%) between pre-industrial and 2°C scenarios.	ISIMIP - The Inter-Sectoral Impact Model Intercomparison Project; Assessing the impacts of 1.5° C global warming - suimulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b).	www.isimip.org
	3. Quality	3.1	Surface water contamination index	Broad suite of pollutants with well-documented direct or indirect negative effects on water resources and biodiversity. Drivers include soil salinization (weighting 11%), nitrogen (N; 13%) and phosphorus (P, 13%) loading, mercury deposition (9%), pesticide loading (13%), sediment loading (12%), organic loading (as Biological Oxygen Demand, BOD; 17%), potential acidification (7%), and thermal alteration (7%). Modes of threat are specific to individual pollutants, ranging from impacts mediated by eutrophication symptoms such as algal blooms and oxygen depletion (e.g., P and organic loading) to direct toxic effects (e.g., pesticides, mercury). Many of these pollutants have detrimental effects on both human water security (HWS) and freshwater biodiversity (BD) through multiple pathways. The weightings used are the average of HWS and BD specific weightings, as both are relevant here. 0.5x0.5degree resolution	Global threats to human water security and river biodiversity; C.J. Vorosmarty, P.B. McIntyre, M.O. Gessner, D. Dudgeon, A. Prusevich, P. Green, S. Glidden, S.E. Bunn, C.A., Sullivan, C. Reidy Liermann, and P.M. Davies; Nature 467, 555-561 (30 September 2010) doi:10.1038/nature09440	www.riverthreat.net
		3.1.1	Nitrogen loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.2	Phosphorus loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.3	Pesticide loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net

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		3.1.4	Soil salination	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.5	Organic loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.6	Sediment loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.7	Mercury loading	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.8	Potential Acidification	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
		3.1.9	Thermal alteration	Indicator informing the overall pollution indicator 3.1. (see 3.1)	Refer to source of 3.1.	www.riverthreat.net
	4. Ecosystem Service Status	4.1	Cumulative threat index to freshwater ecosystem services (biodiversity)	Using a global geospatial 30' latitude/longitude grid, a broad suite of individual stressors has been used to produce the Incident Threat to Biodiversity index. Multiple stressors were combined using relative weights to derive the cumulative threat index. Stressors were expressed as 23 geospatial drivers organized under four themes: catchment disturbance, pollution, water resource development and biotic factors.	Global threats to human water security and river biodiversity; C.J. Vorosmarty, P.B. McIntyre, M.O. Gessner, D. Dudgeon, A. Prusevich, P. Green, S. Glidden, S.E. Bunn, C.A., Sullivan, C. Reidy Liermann, and P.M. Davies; Nature 467, 555-561 (30 September 2010) doi:10.1038/nature09440	www.riverthreat.net
		4.2	Catchment ecosystem services degradation (forest loss)	Applied as a proxy, forest cover represents ecosystem services for freshwater, since forests play an important role in terms of water regulation, supply and pollution/erosion control. The data applied globally represents the amount of tree cover loss (trees higher than 5 meters) in the period between 2000 and 2016.	Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850-53. Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest .	http://earthenginepartners.appspot.com/science-2013-global-forest
		4.3	Projected impacts on freshwater biodiversity	Projected changes [% increase or decrease] in extinction rate of freshwater fish due to water availability loss from climate change are used as a proxy to indicate the impact of climate change on freshwater ecosystem services.	Pablo A. Tedesco, Jean-François Cornu, Bernard Hugueny and Thierry Oberdorff (2013). Freshwater Fish Extinction Rates due to Water Availability Loss from Climate Change. Biodiversity Atlas (atlas.freshwaterbiodiversity.eu) on 18/08/2017.	http://atlas.freshwaterbiodiversity.eu/atlasApp/full/?map=3.2.1-fish-extinction-rates-climate-change

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Regulatory Risk	5. Enabling Environment (Policy & Laws)	5.1	Water strategy	<p>Tries to answer the question: 'Is there a (good) plan from the government to manage water in a sustainable way?' If government is not very active, water availability and quality might be at risk for businesses.</p> <p>Qualitative research on country level. See country datasets under Maps.</p> <p>Currently no global research or database is available on this topic. Quality of available information varies greatly across countries and regions.</p> <p>WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.</p> <p>WWF is looking to research these water aspects further.</p>	WWF & Tecnomia (TYPISA Group)	See country profiles
		5.2	Sophistication of legal framework	<p>Qualitative research on country level. See country datasets under Maps.</p> <p>Currently no global research or database is available on this topic. Quality of available regulatory information varies greatly across countries and regions.</p> <p>WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.</p> <p>WWF is looking to research the regulatory aspects of water further.</p>	WWF & Tecnomia (TYPISA Group)	See country profiles
		5.3	Enabling Environment	<p>"The majority of the data for this indicator come from a survey undertaken during 2011 involving all 192 UN member states at that time. 133 country responses were received to the survey. For the purposes of TWAP RB, additional responses were collected from 15 countries in 2013, using in-country to fill identical survey questionnaires." Status of development of the 'enabling environment' was assessed and scored based on implementation status presented within the TWAP RB project.</p>	TWAP River Basins ; GEF & UNEP	http://twap-rivers.org/
	6. Institutions and Governance	6.1	Corruption Index	<p>The Corruption Perceptions Index aggregates data from a number of different sources that provide perceptions of business people and country experts of the level of corruption in the public sector and is updated annually.</p>	Transparency International	https://www.transparency.org/news/feature/corruption_perceptions_index_2017
		6.2	Freedom in the World Index	<p>Freedom House's indicators consist of two aggregate scores for political rights and civil liberties. The sum of both indicators represents the final aggregate which is classified by Freedom House into 3 categories: F - Free, PF - Partially Free, NF - Not Free. For the scoring in the WRF two transition ranges were added to reflect WRF risk scores.</p>	Freedom House	https://freedomhouse.org/sites/default/files/FH_FITW_Report_2016.pdf
		6.3	Stakeholder platform	<p>Qualitative research on country level. See country datasets under Maps.</p> <p>Currently no global research or database is available on this topic. Quality of available information varies greatly across countries and regions.</p> <p>WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.</p> <p>WWF is looking to create an overview of the existing river basin platforms.</p>	WWF & Tecnomia (TYPISA Group)	See country profiles
	7. Management Instruments	7.1	Enforcement of water-related legal framework	<p>The regulatory (legal) framework may be good on paper, but in some cases the enforcement of it might be lacking, leading to situations where water availability and quality might be at risk for businesses. Qualitative research on country level. See country datasets under Maps.</p> <p>Currently no global research or database is available on this topic. Quality of available regulatory information varies greatly across countries and regions. WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.</p> <p>WWF is looking to research the regulatory aspects of water further.</p>	WWF & Tecnomia (TYPISA Group)	See country profiles

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		7.3	Density of runoff monitoring stations	Density of runoff monitoring within Country/Basin as a proxy of management instruments on water quantity. No data does not necessarily mean that no infrastructure is in place.	GRDC - Global Runoff Data Based	http://www.bafg.de/GRDC/EN/01_GRDC/13_dtbse/databa se_node.html
	8. Infrastructure & Finance	8.1	Access to safe drinking water (% of population)	Percent of people with access to safe drinking water on a country level. 2015.	World Health Organization (WHO) and United Nations Children's Fund (UNICEF)	https://washdata.org/
		8.2	Access to improved sanitation (% of population)	Percent of people with access to improved sanitation on a country level. 2015	World Health Organization (WHO) and United Nations Children's Fund (UNICEF)	https://washdata.org/
		8.3	Access to domestic credit to private sector by banks (% of GDP)	Domestic credit to private sector by banks refers to financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks), such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The indicator is intended to reflect the ability of the private sector to access capital for water infrastructure financing. Medium risk (score 3) was assigned when no country data was available.	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.	http://databank.worldbank.org/data/reports.aspx?source=2&Topic=7
Reputational Risk		9. Cultural importance	9.1	Cultural/religious water role	Water is also a social and cultural good. Reputational risk is linked to the importance of freshwater for the (indigenous) people in their daily life, religion and culture. Qualitative research on country level. See country datasets under Maps. Currently no global research or database is available on this topic. Quality of available information varies greatly across countries and regions. WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.	WWF & Tecnomia (TYPESA Group)
	10. Biodiversity importance	10.1	Freshwater Endemism	Count of endemic fish species as representation of freshwater biodiversity richness	Fresh Water Ecoregions of the World (FEOW); WWF/TNC; Abell et al. (2008). "Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation" BioScience 58(5) 403-414	http://www.feow.org/globalmap
		10.2	Freshwater Biodiversity Richness	Count of fish species as representation of freshwater biodiversity richness	Fresh Water Ecoregions of the World (FEOW); WWF/TNC; Abell et al. (2008). "Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation" BioScience 58(5) 403-414	http://www.feow.org/globalmap
	11. Media	11.1	National	Indicates how aware local residents typically are of water issues in this specific river basin.	WWF & Tecnomia (TYPESA Group)	See country profiles

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	Scrutiny		media coverage	The status of the river basin (scarcity, pollution) is taken into account, as well as the importance of water relative to other aspects in life of the local people (like food and shelter security). Qualitative research on country level. See country datasets under Maps. Currently no global research or database is available on this topic. Quality of available information varies greatly across countries and regions. WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.		
		11.2	Global media coverage	Indicates how aware people outside the basin typically are of water issues in this specific river basin. Familiarity to and media coverage of the region and regional water related disasters are taken into account. Qualitative research on country level. See country datasets under Maps. Currently no global research or database is available on this topic. Quality of available information varies greatly across countries and regions. WWF & Tecnomia used consistent criteria to turn qualitative research into quantitative risk indicators.	WWF & Tecnomia (TYPESA Group)	See country profiles
	12. Trust & Conflict	12.1	Conflict (RepRisk)	RepRisk counts and registers negative stories by company. Negative news are labelled for country, industry class and by theme. For the WRF the count of all negative news for all industries was used and classified based on the recommendation by RepRisk. Count of negative news and classification by distribution: no report: risk score 1; <25 percentile: risk score 2; <50 percentile: risk score 3; <75 percentile: risk score 4; >75 percentile: risk score 5; then the maximum score for categories described in 12.1.1-5 was applied for the overall indicator 12.1	RepRisk AG for WWF	https://www.reprisk.com/
		12.1.1	Water Scarcity	Indicator informing the overall conflict indicator 12.1. (see 12.1)	RepRisk AG for WWF	https://www.reprisk.com/
		12.1.2	Local Pollution	Indicator informing the overall conflict indicator 12.1. (see 12.1)	RepRisk AG for WWF	https://www.reprisk.com/
		12.1.3	Overuse and wasting of resources	Indicator informing the overall conflict indicator 12.1. (see 12.1)	RepRisk AG for WWF	https://www.reprisk.com/
		12.1.4	Impact on community	Indicator informing the overall conflict indicator 12.1. (see 12.1)	RepRisk AG for WWF	https://www.reprisk.com/
		12.1.5	Impact on ecosystem landscape	Indicator informing the overall conflict indicator 12.1. (see 12.1)	RepRisk AG for WWF	https://www.reprisk.com/
		12.2	Corporate Trust (GlobeScan)	This indicator is based on GlobeScan data (Net Trust, by Country, 2016) for the 25 largest economies in the world. As a proxy for other countries, risk levels were applied on continental scale based on common levels available for the continent by combining GlobeScan data and Edelman Trust index 2018 information on corporate trust.	Globescan - Net Trust by Country, 2016; Edelman Trust Index 2018	