Water Risk Filter

December 2020

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 Index	The second version of the Global Aridity Index is a global climate data for the 1970-2000 period, related to evapotranspiration processes and rainfall deficit for potential vegetative growth, based on the implementation of a Penman-Montieth Reference Evapotranspiration (ET0) equation. It provides information about the potential availability of water in regions with low water demand, thus they are used to better account for deserts and other arid areas in the risk assessment.	Trabucco, A., & Zomer, R. Global Aridity Index and Potential Evapotranspiration (ET0) Climate Database v2. figshare. Fileset (2019)	https://cgiarcsi.community/2019/01/24/global-aridity-index-and-potential-evapotranspiration-climate-database-v2/
		1.1	Water Depletion	The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016). Their analysis is based on model outputs from the newest version of the integrated water resources model WaterGAP3 which measures water depletion as the ratio of water consumption-to-availability.	Brauman, K. A., Richter, B. D., Postel, S., Malsy, M., & Flörke, M. (2016). Water depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments. Elem Sci Anth, 4.	http://www.earthstat.org/water-depletion-watergap3-basins/
		1.2	Baseline Water Stress	World Resources Institute's Baseline Water Stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. A higher percentage indicates more competition among users.	Hofste, R., Kuzma, S., Walker, S., ... & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute.	https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data
		1.3	Blue Water Scarcity	The blue water scarcity risk indicator is based on Mekonnen and Hoekstra (2016) global assessment of blue water scarcity on a monthly basis and at high spatial resolution (grid cells of 30 × 30 arc min resolution). Blue water scarcity is calculated as the ratio of the blue water footprint in a grid cell to the total blue water availability in the cell. The time period analyzed in this study ranges from 1996 to 2005.	Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323.	https://advances.sciencemag.org/content/2/2/e1500323

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		1.4	Available Water Remaining (AWARE)	The Available Water Remaining (AWARE) quantifies the potential of water deprivation, to either humans or ecosystems, and serves in calculating the impact score of water consumption in Life Cycle Assessments or to calculate a water scarcity footprint as per ISO 14046. It is based on the available water remaining in a given basin relative to the world average, after human and aquatic ecosystem demands have been met.	Boulay, A. M., Bare, J., Benini, L., Berger, M., Lathuillière, M. J., Manzardo, A., ... & Ridoutt, B. (2018). The WULCA consensus characterization model for water scarcity footprints: assessing impacts of water consumption based on available water remaining (AWARE). The International Journal of Life Cycle Assessment, 23(2), 368-378.	http://www.wulca-waterlca.org/aware.html
		1.5	Drought Frequency Probability	The Standardized Precipitation and Evaporation Index (SPEI) is a multi-scalar drought index applying both precipitation and temperature data to detect, monitor and analyze different drought types and impacts in the context of global warming. The drought frequency probability was computed using the monthly time series of the SPEI 36-month time scale and applying the relative frequency approach – the ratio of the number of months when index is below or equal to events of moderate magnitude (SPEI <= -1) to the total number of possible outcomes, considering the last 10 years (June 2010 - May 2020) as reference period.	Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. Journal of climate, 23(7), 1696-1718.	https://spei.csic.es/index.html
		1.6	Projected Change in Drought Occurrence	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) . 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.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.	https://www.geosci-model-dev.net/10/4321/2017/
	2. Quantity - Flooding	**2.1**	Estimated Flood Occurrence	This risk indicator is based on empirical evidence of large flood events since 1985 to present, registered by the Dartmouth Flood Observatory's Global Active Archive of Large Flood Events. It includes floods due to overflowing rivers, lakes, or oceans, and caused by heavy rainfall, rapid snowmelt, dams or levees break, or storm surge from tropical cyclones or tsunami in coastal areas. The data is derived from a wide variety of news, governmental, instrumental, and remote sensing sources.	Brakenridge, G. R. (2020). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado.	http://floodobservatory.colorado.edu/Archives/index.html
		2.2	Projected Change in Flood Occurrence	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Results are expressed in terms of change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.	https://www.geosci-model-dev.net/10/4321/2017/

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	3. Water Quality	**3.1**	Surface Water Quality Index	This risk indicator is based on a combination of monitoring data and a Machine Learning prediction model, and is composed of three water quality parameter with well documented direct and indirect negative effects on water security for both humans and freshwater biodiversity, which are aligned to the Sustainable Development Goal (SDG) 6.3.2: biological oxygen demand (BOD) as a widely used umbrella proxy for overall water quality; electrical conductivity (EC) as proxy for salinity balance and pH alteration; and nitrogen, to capture nutrient loading in water bodies.	Damania, R., Desbureaux, S., Rodella, A. S., Russ, J., & Zaveri, E. (2019). Quality unknown: The invisible water crisis. The World Bank.	https://openknowledge.worldbank.org/handle/10986/32245
		3.1.1	BOD	Predictions of biological oxygen demand in rivers, based on an annual average.	Damania, R., Desbureaux, S., Rodella, A. S., Russ, J., & Zaveri, E. (2019). Quality unknown: The invisible water crisis. The World Bank.	https://openknowledge.worldbank.org/handle/10986/32245
		3.1.2	Electrical Conductivity	Predictions of electrical conductivity in rivers, based on an annual average.	Damania, R., Desbureaux, S., Rodella, A. S., Russ, J., & Zaveri, E. (2019). Quality unknown: The invisible water crisis. The World Bank.	https://openknowledge.worldbank.org/handle/10986/32245
		3.1.3	Nitrogen	Predictions of nitrogen (nitrate/nitrite) in rivers, based on an annual average.	Damania, R., Desbureaux, S., Rodella, A. S., Russ, J., & Zaveri, E. (2019). Quality unknown: The invisible water crisis. The World Bank.	https://openknowledge.worldbank.org/handle/10986/32245
	4. Ecosystem Service Status	**4.1**	Fragmentation Status of Rivers	This risk indicator is based on the data set by Grill et al. (2019) mapping the world's free-flowing rivers. Grill et al. (2019) compiled a geometric network of the global river system and associated attributes, such as hydro-geometric properties, as well as pressure indicators to calculate an integrated connectivity status index (CSI). While only rivers with high levels of connectivity in their entire length are classified as free-flowing, rivers of CSI < 95% are considered as fragmented at a certain degree.	Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215.	https://figshare.com/articles/Mapping_the_world_s_free-flowing_rivers_data_set_and_technical_documentation/7688801
		4.2	Catchment Ecosystem Services Degradation Level	For this risk indicator, tree cover loss was applied as a proxy to represent catchment ecosystem services degradation since forests play an important role in terms of water regulation, supply and pollution control. The forest cover data is based on Hansen et al.'s global Landsat data at a 30-meter spatial resolution to characterize forest cover and change. The authors defined trees as vegetation taller than 5 meters in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2019.	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tykavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.	http://earthenginepartners.appspot.com/science-2013-global-forest
		4.3	Projected Impacts on Freshwater Biodiversity	The study by Tedesco et al. (2013) to project changes [% increase or decrease] in extinction rate by ~2090 of freshwater fish due to water availability loss from climate change is used as a proxy to estimate the projected impacts on freshwater biodiversity.	Tedesco, P. A., Oberdorff, T., Cornu, J. F., Beauchard, O., Brosse, S., Dürr, H. H., ... & Hugueny, B. (2013). A scenario for impacts of water availability loss due to climate change on riverine fish extinction	http://atlas.freshwaterbiodiversity.eu/atlasApp/full/?map=3.2.1-fish-extinction-rates-climate-change

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					rates. Journal of Applied Ecology, 50(5), 1105-1115.	
Regulatory Risk	**5. Enabling Environment**	**5.1**	Freshwater Policy Status (SDG 6.5.1)	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Policy" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.	https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./
		5.2	Freshwater Law Status (SDG 6.5.1)	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Law(s)" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.	https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./
		5.3	Implementation Status of Water Management Plans (SDG 6.5.1)	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National IWRM Plans" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.	https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./
	6. Institutions & Governance	**6.1**	Corruption Perceptions Index	This risk Indicator is based on the latest Transparency International's data: the Corruption Perceptions Index 2019. This index aggregates data from a number of different sources that provide perceptions of business people and country experts on the level of corruption in the public sector.	Transparency International (2020). Corruption Perceptions Index 2019. Berlin: Transparency International.	https://www.transparency.org/files/content/pages/2019_CPI_Report_EN.pdf
		6.2	Freedom in the World Index	This risk indicator is based on Freedom House (2020), an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2020 edition involved more than 125 analysts and more than 40 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 15 territories from January 1, 2019, through December 31, 2019.	Freedom House (2020). Freedom in the world 2020. Washington, DC: Freedom House.	https://freedomhouse.org/sites/default/files/2020-02/FIW_2020_REPORT_BOOKLET_Final.pdf
		6.3	Business Participation in Water Management (SDG 6.5.1)	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "Business Participation in Water Resources Development, Management and Use" indicator, which corresponds to one of the six national level indicators under the Institutions and Participation category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.	https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./
	7. Management Instruments	**7.1**	Management Instruments for Water	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "Sustainable and efficient water use management" indicator, which corresponds to one of the five national level indicators under the Management Instruments category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for	https://www.unwater.org/publications/progress-on-integrated-water-

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			Management (SDG 6.5.1)	For SDG 6.5.1, management instruments refer to the tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions.	SDG 6 Indicator 6.5.1: degree of IWRM implementation.	resources-management-651./
		7.2	Groundwater Monitoring Data Availability and Management	This risk indicator is based on the data set by UN IGRAC (2019) to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.	UN IGRAC (2019). Global Groundwater Monitoring Network GGMN Portal. UN International Groundwater Resources Assessment Centre (IGRAC).	https://www.un-igrac.org/special-project/ggmn-global-groundwater-monitoring-network
		7.3	Density of Runoff Monitoring Stations	The density of monitoring stations for water quantity was applied as proxy to develop this risk indicator. The Global Runoff Data Base was used to estimate the number of monitoring stations per 1000km2 of the main river system (data base access date: May 2018).	BfG (2019). Global Runoff Data Base. German Federal Institute of Hydrology (BfG).	https://www.bafg.de/GRDC/EN/01_GRDC/13_dtbse/database_node.html
	8. Infrastructure & Finance	**8.1**	Access to Safe Drinking Water	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data . It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.	https://washdata.org/
		8.2	Access to Sanitation	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data . It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.	https://washdata.org/
		8.3	Financing for Water Resource Development and Management (SDG 6.5.1)	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.	https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./
Reputational Risk	**9. Cultural Importance**	**9.1**	Cultural Diversity	Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture. This risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. This cross-mapping showed for the very first time the significant overlap that exists between the global geographic distribution of biodiversity and that of linguistic diversity.	Oviedo, G., Maffi, L., & Larsen, P. B. (2000). Indigenous and traditional peoples of the world and ecoregion conservation: An integrated approach to conserving the world's biological and cultural diversity. Gland: WWF (World Wide Fund for Nature) International.	https://terralingua.org/shop/indigenous-and-traditional-peoples-of-the-world-and-ecoregion-conservation/

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	10. Biodiversity Importance	**10.1**	Freshwater Endemism	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.	http://www.feow.org/
		10.2	Freshwater Biodiversity Richness	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Count of fish species is used as a representation of freshwater biodiversity richness. Companies operating in basins with higher number of fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.	http://www.feow.org/
	11. Media Scrutiny	**11.1**	National Media Coverage	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter). For more information, please check the Country Profiles tab in the EXPLORE section.	WWF & Tecnoma (TYPSA Group)	https://waterriskfilter.panda.org/en/Explore/DataAndMethod
		11.2	Global Media Coverage	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware people are of water-related issues due to global media coverage. Familiarity to and media coverage of the region and regional water-related disasters are taken into account. For more information, please check the Country Profiles tab in the EXPLORE section.	WWF & Tecnoma (TYPSA Group)	https://waterriskfilter.panda.org/en/Explore/DataAndMethod
	12. Conflict	**12.1**	Conflict News Events	This risk indicator is based on 2019 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class.	RepRisk & WWF (2020). Due diligence database on ESG and business conduct risks. RepRisk.	https://www.reprisk.com/
		12.2	Hydro-political Likelihood	This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018). More specifically, it is based on the results of spatial modelling by Farinosi et al. (2018) that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues.	Farinosi, F., Giupponi, C., Reynaud, A., Ceccherini, G., Carmona-Moreno, C., De Roo, A., ... & Bidoglio, G. (2018). An innovative approach to the assessment of hydro-political risk: A spatially explicit, data driven indicator of hydro-political issues. Global environmental change, 52, 286-313.	https://doi.org/10.1016/j.gloenvcha.2018.07.001