Water Risk Filter 5.0
Methodology Documentation

This Water Risk Filter 5.0 Methodology documentation describes the water risk assessment framework, underlying structure and data sources for both basin and operational risk assessment, as well as the framework and logic behind the tool's Response section. This methodology documentation is updated periodically to reflect shifting data sets and other minor changes as need be, so please ensure you are using the latest version available on the Water Risk Filter website: https://waterriskfilter.panda.org/

Contents

A. Water Risk Filter: Assess Section

The Water Risk Filter's risk assessment is based on a company's geographic location, which informs a site's basin-related risks, as well as characteristics of its operating nature (e.g., its reliance upon water, its water use performance given the nature of the business/site), which informs a site's operational-related risks. This section outlines the background behind how both basin risk and operational risk are calculated in the Assess section of the Water Risk Filter tool.

1. Basin Risk Assessment Framework & Data

In version 5.0, a new basin risk data framework was implemented. The basin risk assessment framework has a three-level hierarchy as illustrated in Table 1: 1) risk **type**, 2) risk **category**, 3) risk **indicator**. This structure was put in place for several reasons:

1. There is a general acceptance of these three broad categories (or "types" as they are referred to throughout this document) of corporate water risks[1]: Physical, Regulatory and Reputational risk. This helps to ensure consistency and aligned approaches to water risk assessments and offers users a familiar approach.
2. Employing a hierarchical framework that consist of not only broad risk types, but more specific risk categories (or sub-types), accomplishes three things:
    i. A more comprehensive coverage *within* these broader risk types. For example, physical water risk is comprised of not only water scarcity, but also flooding, quality and ecosystem related risks. By dividing into these risk categories, it helps to take into account these different dimensions within physical risk as an example.
    ii. Given that the Water Risk Filter operates at both the global and local (high resolution) level, the risk type / category structure also ensures a level of consistency in coverage between countries, and between local and global versions, since indicators vary. In other words, the category structure enables the flexibility of adopting different local indicators, whilst maintaining a similar logical structure and output across countries and between high resolution and global level versions.
    iii. It allows a differential number of indicators per category as well as for indicators to be added or removed in the global data set while maintaining relative consistency from year-to-year.

Version 5.0 contains a total of 32 basin risk indicators which are based predominantly on freely available external, peer-reviewed data sets (see section 1.2. for detailed description of each basin risk indicator). These indicators are reviewed and updated (either with new data or with a new indicator) on an annual basis drawing upon the latest research and best available data. Each original data set is first classified into a 1-to-5 value and then subsequently aggregated at the basin or country level. This process creates a series of basin risk indicators out of the raw basin data sets.

[1] The CEO Water Mandate – Driving Harmonization of Water-Related Terminology, Discussion Paper, September 2014, https://ceowatermandate.org/files/MandateTerminology.pdf

The 1-to-5 classification is consistent throughout all risk indicators and is organized as follows:

1) No or very limited risk;
2) Limited risk;
3) Some risk;
4) High risk;
5) Very high risk.

The basin risk indicators are assigned to one of three risk types, and in turn, one of 12 risk categories (Table 1). The basis for these various risk categories was as follows:

A) **Physical**: The four categories reflect key issues regarding water - too little, too much, too dirty, and in turn, the degradation of ecosystem services that play a critical for the hydrological cycle (i.e., provisioning, regulating, supporting freshwater services). Accordingly, physical water risk is divided between scarcity, overabundance, quality, and ecosystem service status.

B) **Regulatory**: Regulatory water risk is heavily tied to the concept of good governance. Two major water governance frameworks were considered – UN Sustainable Development Goal Target 6.5 (SDG 6.5) and the OECD water governance framework[2]. Given that SDG 6.5 is well accepted, is organized into four categories, and has data being collected by various governments, it was used as the basis for this indicator. SDG 6.5 breaks water governance into the following categories: enabling environment (largely concerned with laws & policies), institutions & governance (concerned with the ability to convene and engage), management instruments (concerned with data & enforcement), and infrastructure & finance (concerned with whether funds are accessible to build critical water-related infrastructure). While access to safe drinking water, adequate sanitation and hygiene awareness (WASH) could have been considered a physical risk, it was classified within the regulatory risk category, infrastructure & finance, largely because it tends to be most prevalent in cases where critical WASH infrastructure is lacking.

C) **Reputational**: While a considerable amount of reputational water risk is operational (not basin-related), there are some basin pre-conditions that make reputational water risk more likely to manifest. Based on research carried out to identify drivers for reputational water risk[3], a mix of predictors (cultural, media coverage), and evidence (conflict) were ultimately selected as the four risk categories.

Each basin risk indicator, risk category and risk type have weightings which are industry-specific. The Water Risk Filter 5.0 contains default industry-specific weightings for a total of 25 industry categories (see Appendix 1 for detailed information of default weightings for each industry). These industry categories were developed based on a harmonized list of different standard industry classifications (i.e., Global Industry Classification Systems - GICS, CDP industry classification, etc.). For the purpose of the Water Risk Filter, a narrowed down list of 25 industry categories was identified (down from 33 in the previous version of the tool), since some broader GICS classifications (e.g., Food and Beverage) face greater water risk and therefore are better served through disaggregation, while others facing lower water risk (e.g., Professional Services, Software, Real Estate, Financial Institutions) need not be disaggregated and were therefore grouped into the same category. The default industry-specific weightings are based on multiple stakeholder consultations and peer reviews with experts from

[2] OECD Principles on Water Governance, May 2015 http://www.oecd.org/cfe/regional-policy/OECD-Principles-on-Water-Governance.pdf
[3] For example, Honey, G. (2017) A Short Guide to Reputation Risk, ISBN 978-0-566-08995-4

different NGOs, academics, financial institutions and businesses. The weights are also informed by CDP Water Security data from 2013-2017. It is also worth noting that the user can change the default industry-specific weightings to refine the risk assessment based on their expert opinion and risk perception using the 'Tailor Weightings' button in the Analyse Risk tab.

Based on the Water Risk Filter's 32 global basin risk indicators and industry weightings, basin risk scores are generated. The same process is employed for the higher resolution risk data sets (see section 1.2. for detailed information on high resolution data sets).

It should be noted that the logic that underpins the water risk assessment is to evaluate average, recent water risk conditions, as well as some level of future risk. In other words, it is looking at typical conditions with a bias towards more recent circumstances. Conversely, it is not intended to assess real-time water risk conditions.

Table 1. Three-level hierarchy of the basin risk framework: water risk type, category and indicator.

Risk type	Risk category	Risk indicator
Physical Risk	1 - Physical: Quantity - Scarcity	1.0 – Aridity 1.1 - Water Depletion 1.2 - Baseline Water Stress 1.3 - Blue Water Scarcity 1.4 - Projected Change in Water Discharge (by ~2050) 1.5 - Drought Frequency Probability 1.6 - Projected Change in Drought Occurrence (by ~2050)
	2 - Physical: Quantity - Flooding	2.1 - Estimated Flood Occurrence 2.2 - Projected Change in Flood Occurrence (by ~2050)
	3 - Physical: Quality	3.1 - Surface Water Contamination Index *3.1.1 - Nitrogen loading* *3.1.2 - Phosphorus loading* *3.1.3 - Pesticide loading* *3.1.4 - Soil salination* *3.1.5 - Organic loading* *3.1.6 - Sediment loading* *3.1.7 - Mercury loading* *3.1.8 - Potential acidification*
	4 - Physical: Ecosystem Service Status	4.1 - Fragmentation Status of Rivers 4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) 4.3 - Projected Impacts on Freshwater Biodiversity
Regulatory Risk	5 - Regulatory: Enabling Environment (Policy & Laws)	5.1 - Freshwater Policy Status (SDG 6.5.1) 5.2 - Freshwater Law Status (SDG 6.5.1) 5.3 - Implementation Status of Water Management Plans (SDG 6.5.1)
	6 - Regulatory: Institutions and Governance	6.1 - Corruption Perceptions Index 6.2 - Freedom in the World Index 6.3 - Business Participation in Water Management (SDG 6.5.1)
		7.1 - Management Instruments for Water Management (SDG 6.5.1)

	7 - Regulatory: Management Instruments	7.2 - Groundwater Monitoring Data Availability and Management 7.3 - Density of Runoff Monitoring Stations
	8 - Regulatory: Infrastructure & Finance	8.1 - Access to Safe Drinking Water 8.2 - Access to Sanitation 8.3 - Financing for Water Resource Development and Management (SDG 6.5.1)
Reputational Risk	9 - Reputational: Cultural Importance	9.1 - Cultural Diversity
	10 - Reputational: Biodiversity Importance	10.1 - Freshwater Endemism 10.2 – Freshwater Biodiversity Richness
	11 - Reputational: Media Scrutiny	11.1 – National Media Coverage 11.2 – Global Media Coverage
	12 - Reputational: Conflict	12.1 - Conflict News Events (RepRisk) *12.1.1 -Water Scarcity* *12.1.2 - Local Pollution* *12.1.3 - Overuse and wasting of resources* *12.1.4 - Impact on community* *12.1.5 - Impact on ecosystem landscape* 12.2 - Hydro-political Risk

1.1. Global Basin Risk Indicators

The 32 global basin risk indicators are described in detail in this section, including information on the data sources, risk score categories and rationale. This information can also be downloaded in a tabular format in the **Data & Methods** tab in the Water Risk Filter 5.0.

The spatial unit of aggregation used to for the basin risk data and map visualization is either: (A) HydroSHEDS[4] HydroBASIN Level 7 or (B) Country boundaries. Depending on the nature of the native data, data are aggregated to the most suitable level. Wherever possible, data have been aggregated using the HydroBASIN Level 7 layer, however where data are derived from data that is national level in its raw format, these were represented using country boundaries. Table 2 shows the level of spatial aggregation used for each risk indicator.

HydroSHEDS was selected both because of its credibility as a data layer, but also because it can be aggregated at various levels – from Level 1 (roughly the level of continental divides), all the way down to Level 12 (the highest possible resolution, which is often in the range of 25km^2). HydroSHEDS is also linked to additional data sets in the HydroATLAS database, lending itself to additional layers and future growth. For further information on HydroSHEDS, please visit www.hydrosheds.org.

[4] Lehner, B., Verdin, K., Jarvis, A. (2008): New global hydrography derived from spaceborne elevation data. Eos, Transactions, AGU, 89(10): 93-94. For additional details, please visit: http://www.worldwildlife.org/hydrosheds

Table 2: Level of spatial aggregation for basin risk indicators

Basin Risk indicator	Native format	Aggregation
1.0 - Aridity	Grid	HydroBASIN Level 7
1.1 - Water Depletion	Grid	HydroBASIN Level 7
1.2 - Baseline Water Stress	Grid	HydroBASIN Level 7
1.3 - Blue Water Scarcity	Grid	HydroBASIN Level 7
1.4 - Projected Change in Water Discharge (by ~2050)	Grid	HydroBASIN Level 7
1.5 - Drought Frequency Probability	Grid	HydroBASIN Level 7
1.6 - Projected Change in Drought Occurrence (by ~2050)	Grid	HydroBASIN Level 7
2.1 - Estimated Flood Occurrence	Polygon	HydroBASIN Level 7
2.2 - Projected Change in Flood Occurrence (by ~2050)	Grid	HydroBASIN Level 7
3.1 - Surface Water Contamination Index	Grid	HydroBASIN Level 7
4.1 - Fragmentation Status of Rivers	Polyline	HydroBASIN Level 6
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss)	Grid	HydroBASIN Level 7
4.3 - Projected Impacts on Freshwater Biodiversity	Polygon	HydroBASIN Level 7
5.1 - Freshwater Policy Status (SDG 6.5.1)	Country boundaries	Country boundaries
5.2 - Freshwater Law Status (SDG 6.5.1)	Country boundaries	Country boundaries
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1)	Country boundaries	Country boundaries
6.1 - Corruption Perceptions Index	Country boundaries	Country boundaries
6.2 - Freedom in the World Index	Country boundaries	Country boundaries
6.3 – Business Participation in Water Management (SDG 6.5.1)	Country boundaries	Country boundaries
7.1 - Management Instruments for Water Management (SDG 6.5.1)	Country boundaries	Country boundaries
7.2 - Groundwater Monitoring Data Availability and Management	Point	Country boundaries
7.3 - Density of Runoff Monitoring Stations	Point	HydroBASIN Level 7
8.1 - Access to Safe Drinking Water	Country boundaries	Country boundaries
8.2 - Access to Sanitation	Country boundaries	Country boundaries
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1)	Country boundaries	Country boundaries
9.1 - Cultural Diversity	Country boundaries	Country boundaries
10.1 - Freshwater Endemism	Polygon	HydroBASIN Level 7
10.2 – Freshwater Biodiversity Richness	Polygon	HydroBASIN Level 7
11.1 – National Media Coverage	Country boundaries	Country boundaries
11.2 – Global Media Coverage	Country boundaries	Country boundaries
12.1 - Conflict News Events (RepRisk)	Country boundaries	Country boundaries
12.2 - Hydro-political Risk	Grid	HydroBASIN Level 7

All of the basin risk indicators in the tool are reviewed and, as appropriate, updated on an annual basis, generally between June and August, and using latest available data. Table 3 provides an overview of update frequency of the underlying raw data sets, latest date of raw data available, and data access/data cut of raw data that is currently used for Water Risk Filter. The update frequencies are categorized into several categories as listed below:

- No updating: These data sets are generated as one time data sets and may be updated in the future, but it is unknown as to whether they will be
- Infrequent: These data sets are updated from time to time and on an irregular basis
- Annual: These data sets are updated annually
- Monthly: These data sets are updated monthly
- Continuously: These data sets are updated weekly or more frequently

Note that where the update frequency of the raw data set is more frequent than annual, the most recent cut is taken, but the Water Risk Filter's update frequency remains on an annual basis.

Table 3: Data update information

Basin Risk indicator	Update frequency of raw data set	Date of latest raw data available	Data access date for WRF
1.0 - Aridity	Infrequent	2009	May 2018
1.1 - Water Depletion	Infrequent	2016	May 2018
1.2 - Baseline Water Stress	Infrequent	2019	May 2018
1.3 - Blue Water Scarcity	No updating	2016	May 2019
1.4 - Projected Change in Water Discharge (by ~2050)	No updating	2018	May 2018
1.5 - Drought Frequency Probability	Monthly	2019	May 2019
1.6 - Projected Change in Drought Occurrence (by ~2050)	No updating	2018	May 2018
2.1 - Estimated Flood Occurrence	Continuously	2019	May 2019
2.2 - Projected Change in Flood Occurrence (by ~2050)	No updating	2018	May 2018
3.1 - Surface Water Contamination Index	No updating	2010	May 2018
4.1 - Fragmentation Status of Rivers	No updating	2019	May 2019
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss)	Monthly	2018	May 2019
4.3 - Projected Impacts on Freshwater Biodiversity	No updating	2013	August 2017
5.1 - Freshwater Policy Status (SDG 6.5.1)	Annual	2018	March 2019
5.2 - Freshwater Law Status (SDG 6.5.1)	Annual	2018	March 2019
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1)	Annual	2018	March 2019
6.1 - Corruption Perceptions Index	Annual	2018	June 2019
6.2 - Freedom in the World Index	Annual	2018	June 2019
6.3 – Business participation in Water Management (SDG 6.5.1)	Annual	2018	March 2019
7.1 - Management Instruments for Water Management (SDG 6.5.1)	Annual	2018	March 2019
7.2 - Groundwater Monitoring Data Availability and Management	Continuously	2019	March 2019
7.3 - Density of Runoff Monitoring Stations	Continuously	2018	May 2018
8.1 - Access to Safe Drinking Water	Bi-annual	2017	May 2019
8.2 - Access to Sanitation	Bi-annual	2017	May 2019
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1)	Annual	2018	March 2019
9.1 - Cultural Diversity	No updating	2000	June 2019
10.1 - Freshwater Endemism	No updating	2015	September 2017
10.2 – Freshwater Biodiversity Richness	No updating	2015	September 2017
11.1 – National Media Coverage	No updating	2011	NA – 2011 data used
11.2 – Global Media Coverage	No updating	2011	NA – 2011 data used
12.1 - Conflict News Events (RepRisk)	Monthly	2018	April 2019
12.2 - Hydro-political Risk	No updating	2018	April 2019

1.1.1. Physical Risk Type

1) Quantity – Scarcity Risk Category

1.0. Aridity Risk Indicator

The aridity risk indicator is based on the Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial data sets by Trabucco and Zomer (2009)[5]. These data sets provide information about the potential availability of water in regions with low water demand, thus they are used in the Water Risk Filter 5.0 to better account for deserts and other arid areas in the risk assessment. Understanding whether basins are dry is critical to also evaluate scarcity and stress – the latter of which account for not only supply, but demand, and (in the case of stress) availability impacted by water quality.

[5] Trabucco, A., & Zomer, R. J. (2009). Global potential evapo-transpiration (Global-PET) and global aridity index (Global-Aridity) geo-database. CGIAR consortium for spatial information.

Aridity is usually expressed as a generalized function of precipitation, temperature and potential evapo-transpiration. An Aridity Index (UNEP, 1997) can be used to quantify precipitation availability over atmospheric water demand. UNEP breaks up the Aridity Index into a generalized climate classification scheme for Global-Aridity values, ranging from Humid (>0.65 Aridity Index Value) to Hyper-Arid (<0.03 Aridity Index Value). The Water Risk Filter 5.0 applies UNEP's classification scheme for the 5 risk score categories for the aridity risk indicator as shown in the Table below.

Water Risk Filter Risk Scores	Aridity Index Categories	Aridity Index Value
1 – Very Low Risk	Humid	> 0.65
2 – Low Risk	Dry sub-humid	0.5 – 0.65
3 – Moderate Risk	Semi-arid	0.2 – 0.5
4 – High Risk	Arid	0.03 – 0.2
5 – Very High Risk	Hyper-arid	< 0.03

1.1. Water Depletion Risk Indicator

The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016)[6]. Their analysis is based on model outputs from the newest version of the integrated water resources model WaterGAP3.

Water depletion is the ratio of water consumption-to-availability. Brauman et al. (2016) characterization of water depletion uses calculations from WaterGAP3 to assess long-term average annual consumed fraction of renewably available water, then integrates seasonal depletion and dry-year depletion (based on WaterGAP3) with average annual depletion into a unified scale.
The water depletion metric combines both spatial and temporal scarcity into a unified metric. Also, depletion focuses on water consumption rather than withdrawals, which differentiates it from indicators 1.2.

Based on Brauman et al.'s water depletion categories, WWF classified the water depletion risk indicator into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	Water Depletion Categories	Thresholds
1 – Very Low Risk	Abundant	Annual average <5% depleted
2 – Low Risk	Sufficient	Annual average is 5-75% depleted
3 – Moderate Risk	Moderate	Dry-year depletion: for at least 10% of the time, the monthly depletion ratio >75%
4 – High Risk	Significant	Seasonal depletion: for one month of the year on average, the monthly depletion ratio is >75%
5 – Very High Risk	Severe	Ongoing depletion: the monthly depletion ratio on average >75%

[6] 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.

1.2. Baseline Water Stress Risk Indicator

World Resources Institute's Baseline Water Stress risk indicator[7] 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. In contrast to indicator 1.1, Baseline Water Stress looks at withdrawals and is based on average conditions, which is a complementary perspective.

WWF has incorporated the latest Baseline Water Stress dataset published in August 2019 by World Resource Institute (WRI) into the Water Risk Filter and applied the same 5 level risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Baseline Water Stress Categories	Ratio of withdrawals to supply
1 – Very Low Risk	Low stress	<10%
2 – Low Risk	Low to medium stress	10-20%
3 – Moderate Risk	Medium to high stress	20-40%
4 – High Risk	High stress	40-80%
5 – Very High Risk	Extremely high stress	>80%

1.3. Blue Water Scarcity Risk Indicator

The blue water scarcity risk indicator is based on Mekonnen and Hoekstra (2016)[8] 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.

WWF has incorporated Mekonnen and Hoekstra (2016) blue water scarcity data set into the Water Risk Filter and applied a 5 level risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Blue Water Scarcity Index
1 – Very Low Risk	< 0.2
2 – Low Risk	0.2 - 1.0
3 – Moderate Risk	1.0 - 2.0
4 – High Risk	2.0 - 5.0
5 – Very High Risk	> 5.0

1.4. Projected Change in Water Discharge Risk Indicator

This risk indicator is based on multi-model simulation that applies both global climate and hydrological models from the Inter-Sectoral Impact Model Intercomparison Project[9] (ISIMIP). To

[7] WRI Aqueduct 3.0: https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data
[8] Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323
[9] Schewe, J., Heinke, J., Gerten, D., Haddeland, I., Arnell, N. W., Clark, D. B., ... & Gosling, S. N. (2014). Multimodel assessment of water scarcity under climate change. Proceedings of the National Academy of Sciences, 111(9), 3245-3250.

estimate the change at 2°C of global warming above 1980-2010 levels, simulated annual water discharge was averaged over a 31-year period with 2°C mean warming. Results are expressed in terms of relative change (%) in probability between present day (1980-2010) conditions and 2°C scenarios by 2050.

WWF partnered with the Potsdam Institute for Climate Impact Research (PIK) to develop the underlying data described above. WWF classified the results into 5 risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Projected Change in Water Discharge Categories: Relative change (%)
1 – Very Low Risk	No change or positive change
2 – Low Risk	1 - 20% less run-off
3 – Moderate Risk	20 - 40% less run-off
4 – High Risk	40 - 80% less run-off
5 – Very High Risk	>80% less run-off

1.5. Drought Frequency Probability Risk Indicator

This risk indicator is based on the Standardized Precipitation and Evaporation Index (SPEI)[10]. Vicente-Serrano et al. (2010) developed this 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 mathematical calculations used for SPEI are similar to the Standard Precipitation Index (SPI), but it has the advantage to include the role of evapotranspiration.

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 2009 - May 2019) as reference period.

With this approach, WWF estimated the relative frequency probability of hydrological drought events of moderate magnitude occurring in any 1-year period, and further classified it into 5 risk scores, as shown in the Table below.

Water Risk Filter Risk Scores	Probability
1 – Very Low Risk	<= 20%
2 – Low Risk	>20% and <= 40%
3 – Moderate Risk	>40% and <= 60%
4 – High Risk	>60% and <= 80%
5 – Very High Risk	>80%

[10] 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.

1.6. Projected Change in Drought Occurrence Risk Indicator

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)[11]. 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.

WWF partnered with the Potsdam Institute for Climate Impact Research to develop the underlying data described above. WWF classified the results into 5 risk score categories for the projected change in occurrence of droughts risk indicator, as shown in the Table below.

Water Risk Filter Risk Scores	Projected Change in Occurrence of Droughts Categories: Relative change (%)
1 – Very Low Risk	No change or lower occurrence of droughts
2 – Low Risk	1 - 2% more droughts
3 – Moderate Risk	2 - 4% more droughts
4 – High Risk	4 - 6% more droughts
5 – Very High Risk	>6% more droughts

2) Quantity – Flooding Risk Category

2.1. Estimated Flood Occurrence Risk Indicator

This risk indicator is based on the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory[12], University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source.

WWF assigned the risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Estimated Occurrence of Floods Categories
1 – Very Low Risk	No floods occurred between 1985 to 2019
2 – Low Risk	1 – 3 floods occurred between 1985 to 2019
3 – Moderate Risk	4 – 30 floods occurred between 1985 to 2019
4 – High Risk	31 – 400 floods occurred between 1985 to 2019
5 – Very High Risk	>400 floods occurred between 1985 to 2019

2.2. Projected Change in Flood Occurrence Risk Indicator

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)[8]. The magnitude of the

[11] 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.
[12] Brakenridge, G. R. (2019). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado.

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.

WWF partnered with Potsdam Institute for Climate Impact Research to develop the underlying data described above. WWF classified the results into 5 risk score categories for the projected change in occurrence of floods risk indicator, as shown in the Table below.

Water Risk Filter Risk Scores	Projected Change in Occurrence of Floods Categories: Relative change (%)
1 – Very Low Risk	No change or lower occurrence of floods
2 – Low Risk	1 - 5% more floods
3 – Moderate Risk	5 – 10% more floods
4 – High Risk	10 – 15% more floods
5 – Very High Risk	>15% more floods

3) Quality Risk Category

3.1. Surface Water Contamination Risk Indicator

The underlying data for this risk indicator is based on a broad suite of pollutants[13] with well-documented direct or indirect negative effects on water security for both humans and freshwater biodiversity, compiled by Vörösmarty et al. (2010). The negative effects are specific to individual pollutants, ranging from impacts mediated by eutrophication such as algal blooms and oxygen depletion (e.g., caused by phosphorus and organic loading) to direct toxic effects (e.g., caused by pesticides, mercury).

The overall Surface Water Contamination Index is calculated based on a range of key pollutants with different weightings according to the level of their negative effects on water security for both humans and freshwater biodiversity: soil salinization (8%), nitrogen (12%) and phosphorus (P, 13%) loading, mercury deposition (5%), pesticide loading (10%), sediment loading (17%), organic loading (as Biological Oxygen Demand, BOD; 15%), potential acidification (9%), and thermal alteration (11%).

WWF assigned the risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Surface Water Contamination Categories	Surface Water Contamination Index Range
1 – Very Low Risk	No/very low risk of surface water contamination	<0.2
2 – Low Risk	Low risk of surface water contamination	0.2- 0.35
3 – Moderate Risk	Medium risk of surface water contamination	0.35 - 0.55
4 – High Risk	High risk of surface water contamination	0.55 - 0.75
5 – Very High Risk	Very high risk of surface water contamination	0.7 - 1.0

In addition to the overall surface water contamination risk indicator, data for different pollutants are included in the Water Risk Filter 5.0 as sub-risk indicators.

[13] Vörösmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., ... & Davies, P. M. (2010). Global threats to human water security and river biodiversity. Nature, 467(7315), 555.

4) Ecosystem Service Status Risk Category

4.1. Fragmentation Status of Rivers Risk Indicator

This risk indicator is based on the data set by Grill et al. (2019)[14] 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.

The Water Risk Filter 5.0 uses the HydroSHEDS level 6 basins and all river reaches of order <= 8 in the dataset to calculate the percentage of the basins' volume considered as fragmented (e.g not classified as 'Free-flowing'). The fragmentation status was further classified it into 5 risk score categories, as shown in the Table below.

Water Risk Filter Risk Scores	Fragmentation status
1 – Very Low Risk	0% (All the volume is free-flowing)
2 – Low Risk	>0% and <=20%
3 – Moderate Risk	>20% and <=70%
4 – High Risk	>70% and <=90%
5 – Very High Risk	>90%

4.2. Catchment Ecosystem Services Degradation Level (Tree Cover Loss) Risk Indicator

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[15]. 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 – 2018. WWF assigned risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Catchment Ecosystem Services Degradation Categories	Percentage of Tree Cover Loss from 2000 to 2018
1 – Very Low Risk	No/very low degradation	<= 1%
2 – Low Risk	Low degradation	>1% and <= 2%
3 – Moderate Risk	Medium degradation	>2% and <= 5%
4 – High Risk	High degradation	>5% and <= 20%
5 – Very High Risk	Very high degradation	>20%

[14] 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.
[15] Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tyukavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.

4.3. Projected Impacts on Freshwater Biodiversity Risk Indicator

The study by Tedesco et al. (2013)[16] to project changes [% increase or decrease] in extinction rate of freshwater fish due to water availability loss from climate change is used as a proxy to estimate the projected impacts on freshwater biodiversity.

WWF assigned risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Projected Impacts on Freshwater Biodiversity Categories	Percentage Change in Freshwater Fish Extinction Rates
1 – Very Low Risk	No/positive impacts	Positive or no change in fish extinction rates
2 – Low Risk	Low negative impacts	0-5% increase in fish extinction rates
3 – Moderate Risk	Medium negative impacts	5-20% increase in fish extinction rates
4 – High Risk	High negative impacts	20-50% increase in fish extinction rates
5 – Very High Risk	Very high negative impacts	>50% increase in fish extinction rates

1.1.2. Regulatory Risk Type

To assess regulatory water risks, the Water Risk Filter adopted the framework and integrated (when possible) the data sets collected by UN Environment for monitoring countries progress to achieve UN Sustainable Development Goal 6.5.1. on the degree of implementation of Integrated Water Resource Management (IWRM).[17] More specifically, SDG indicator 6.5.1 on IWRM implementation is measured on a scale of zero to 100, based on the degree of implementation using 33 questions in a self-assessed country questionnaire, organized into four categories. These four categories were adopted as the four regulatory risk categories in the Water Risk Filter.

5) Enabling Environment (Policy & Laws) Risk Category

In the Water Risk Filter, all three risk indicators under this enabling environment risk category are based on the UN SDG 6.5.1. database[17]. As defined by UN 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.

5.1. Freshwater Policy Status (SDG 6.5.1) Risk Indicator

This risk indicator is based on SDG 6.5.1. "National Water Resources Policy" indicator[17], which corresponds to one of the three national level indicators under the enabling environment category.

WWF classified the SDG 6.5.1. "National Water Resources Policy" indicator scores into the 5 risk score categories presented in the Table below.

[16] Tedesco P.A., Cornu J-F., Hugueny B. and Oberdorff T. (2013). Freshwater Fish Extinction Rates due to Water Availability Loss from Climate Change. Accessed through the Global Freshwater Biodiversity Atlas (atlas.freshwaterbiodiversity.eu) on 08/2019. http://atlas.freshwaterbiodiversity.eu/atlasApp/full/?map=3.2.1-fish-extinction-rates-climate-change

[17] 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./

Water Risk Filter Risk Scores	SDG 6.5.1. National Water Resources Policy Scores
1 – Very Low Risk	Country has a very high status of implementation: >70
2 – Low Risk	Country has a high status of implementation: >50 to <=70
3 – Moderate Risk	Country has a moderate status of implementation: >30 to <=50 / or no data
4 – High Risk	Country has a low status of implementation: >10 to <=30
5 – Very High Risk	Country has a very low status of implementation: 0 to <=10

5.2. Freshwater Law Status (SDG 6.5.1) Risk Indicator

This risk indicator is based on SDG 6.5.1. "National Water Resources Law(s)" indicator[17], which corresponds to one of the three national level indicators under the enabling environment category.

WWF classified the SDG 6.5.1. "National Water Resources Law(s)" indicator scores into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	SDG 6.5.1. National Water Resources Law(s) Scores
1 – Very Low Risk	Country has a very high status of implementation: >70
2 – Low Risk	Country has a high status of implementation: >50 to <=70
3 – Moderate Risk	Country has a moderate status of implementation: >30 to <=50 / or no data
4 – High Risk	Country has a low status of implementation: >10 to <=30
5 – Very High Risk	Country has a very low status of implementation: 0 to <=10

5.3. Implementation Status of Water Management Plans (SDG 6.5.1) Risk Indicator

This risk indicator is based on SDG 6.5.1. "National IWRM plans" indicator[17], which corresponds to one of the three national level indicators under the enabling environment category.

WWF classified the SDG 6.5.1. "National IWRM plans" indicator scores into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	SDG 6.5.1. National IWRM Plans Scores
1 – Very Low Risk	Country has a very high status of implementation: >70
2 – Low Risk	Country has a high status of implementation: >50 to <=70
3 – Moderate Risk	Country has a moderate status of implementation: >30 to <=50 / or no data
4 – High Risk	Country has a low status of implementation: >10 to <=30
5 – Very High Risk	Country has a very low status of implementation: 0 to <=10

6) Institutions and Governance Risk Category

6.1. Corruption Perceptions Index Risk Indicator

This risk Indicator is based on the latest Transparency International's data: The Corruption Perceptions Index 2018[18]. 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.

WWF classified Transparency International's Corruption Perceptions Index into 5 risk scores, as shown in the Table below.

Water Risk Filter Risk Scores	Corruption Index Categories	Corruption Perceptions Index
1 – Very Low Risk	Very low corruption	>= 80
2 – Low Risk	Low corruption	<80 and >=60
3 – Moderate Risk	Medium corruption	<60 and >=40
4 – High Risk	High corruption	<40 and >=20
5 – Very High Risk	Very high corruption	<20

6.2. Freedom in the World Index Risk Indicator

This risk indicator is based on Freedom House (2019)[19], 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 2019 edition involved more than 100 analysts and more than 30 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 14 territories from January 1, 2018, through December 31, 2018.

WWF applied Freedom House data's aggregated score, and further classified it into 5 risk scores, as shown in the Table below.

Water Risk Filter Risk Scores	Freedom Status Categories	Freedom in the World Aggregate Score
1 – Very Low Risk	Free country with a very high degree of freedom	>= 75
2 – Low Risk	Partially free country with a high degree of freedom	<75 and >= 50
3 – Moderate Risk	Partly free country with some freedom	<50 and >= 40
4 – High Risk	Partly free country with low degree of freedom	<40 and >= 30
5 – Very High Risk	Country not free with very low degree of freedom	<30

6.3. Business participation in water management instruments (SDG 6.5.1) Risk Indicator

This risk indicator is based on SDG 6.5.1. "Business Participation in Water Resources Development, Management and Use" indicator[17], which corresponds to one of the six national level indicators under the institutions and participation category.

[18] Transparency International (2019), Corruption Perceptions Index 2018. https://www.transparency.org/cpi2018
[19] Freedom House (2019). Freedom in the World Countries https://freedomhouse.org/report/countries-world-freedom-2019

WWF classified the SDG 6.5.1. "Business Participation in Water Resources Development, Management and Use" indicator scores into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	SDG 6.5.1. Business Participation in Water Management Scores
1 – Very Low Risk	Country has a very high status of business participation in water management: >70
2 – Low Risk	Country has a high status of business participation in water management: >50 to <=70
3 – Moderate Risk	Country has a moderate status of business participation in water management: >30 to <=50 / or no data
4 – High Risk	Country has a low status of business participation in water management: >10 to <=30
5 – Very High Risk	Country has a very low status of business participation in water management: 0 to <=10

7) Management Instruments Risk Category

7.1. Management Instruments for Water Management (SDG 6.5.1) Risk Indicator

As defined by UN 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.

This risk indicator is based on SDG 6.5.1. "Sustainable and efficient water use management"[17] indicator, which corresponds to one of the five national level indicators under the management instruments category.

WWF classified the SDG 6.5.1. "Sustainable and efficient water use management" indicator scores into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	SDG 6.5.1. Sustainable and Efficient Water Use Management Scores
1 – Very Low Risk	Country has a very high status of implementation: >70
2 – Low Risk	Country has a high status of implementation: >50 to <=70
3 – Moderate Risk	Country has a moderate status of implementation: >30 to <=50 / or no data
4 – High Risk	Country has a low status of implementation: >10 to <=30
5 – Very High Risk	Country has very limited or no management instruments: 0 to <=10

7.2. Groundwater Monitoring Data Availability and Management Risk Indicator

This risk indicator is based on the data set by UN IGRAC (2019)[20] 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

[20] 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

IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.

Companies operating in countries with national groundwater monitoring programmes, that provide data for NGOs and processed information suitable for non-experts face very limited risks. In contrast, companies operating in countries with no national programmes, or only local networks that do not publish data or information face higher levels of risk.

This risk indicator considers only groundwater level monitoring (quantitative monitoring) since currently there is not sufficient information to compile it considering also groundwater quality monitoring networks.

7.3. Density of Runoff Monitoring Risk Indicator

The density of monitoring stations for water quantity was applied as proxy to develop this risk indicator. The Global Runoff Data Base[21] was used to estimate the number of monitoring stations per 1000km^2 of the main river system (data base access date: May 2018).

WWF assigned the risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Monitoring Density Categories	Number of monitoring stations per 1000km^2 of the main river system
1 – Very Low Risk	High monitoring density	50 - 230 monitoring stations
2 – Low Risk	Moderate monitoring density	5 - 50 monitoring stations
3 – Moderate Risk	Low monitoring density	1 - 5 monitoring stations
4 – High Risk	Very low monitoring density	1 monitoring station
5 – Very High Risk	No monitoring data in basin	No stations

8) Infrastructure and Finance Risk Category

8.1. Access to Safe Drinking Water Risk Indicator

This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data[22]. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.

WWF applied the proportion of population using at least basic drinking water services, by country, and further classified it into 5 risk score categories, as shown in the Table below.

Water Risk Filter Risk Scores	Percentage of population using basic drinking water services	Percentage of population using basic drinking water services
1 – Very Low Risk	Very high	>95%
2 – Low Risk	High	>90% and <=95%
3 – Moderate Risk	Medium	>80% and <=90%

[21] 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

[22] United Nations Children's Fund (UNICEF) and World Health Organization (WHO), Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) (2019) Estimates on the use of water, sanitation and hygiene by country (2000-2017). Available online: https://washdata.org/data

4 – High Risk	Low	>60% and <=80%
5 – Very High Risk	Very low	<=60%

8.2. Access to Sanitation Risk Indicator

This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data[23]. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.

WWF proportion of population using at least basic sanitation services, by country, and further classified it into 5 risk scores, as shown in the Table below.

Water Risk Filter Risk Scores	Percentage of population using basic sanitation services	Percentage of population using basic sanitation services
1 – Very Low Risk	Very high	>95%
2 – Low Risk	High	>90% and <=95%
3 – Moderate Risk	Medium	>80% and <=90%
4 – High Risk	Low	>60% and <=80%
5 – Very High Risk	Very low	<=60%

8.3. Financing for Water Resource Development and Management (SDG 6.5.1) Risk Indicator

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[17].

This risk indicator is based on the average 'Financing' score for this category in SDG 6.5.1. data set and is classified into the 5 risk score categories presented in the Table below.

Water Risk Filter Risk Scores	SDG 6.5.1. Average 'Financing' Score
1 – Very Low Risk	Country has a very high level of financing for water resource development and management: >70
2 – Low Risk	Country has a high level of financing for water resource development and management: >50 to <=70
3 – Moderate Risk	Country has a moderate level of financing for water resource development and management: >30 to <=50 / or no data
4 – High Risk	Country has a low level of financing for water resource development and management: >10 to <=30
5 – Very High Risk	Country has very limited or no level of financing for water resource development and management: 0 to <=10

[23] United Nations Children's Fund (UNICEF) and World Health Organization (WHO), Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP). (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Available online: https://washdata.org/data

1.1.3. Reputational Risk Type

9) Cultural Diversity Risk Category

9.1. Cultural Diversity Risk Indicator

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 the WWF & Terralingua work (Oviedo et al. 2000)[24], 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.

WWF applied the number of ethnolinguistic groups by country as a proxy to cultural diversity, and further classified it into 5 risk scores, as shown in the Table below.

Water Risk Filter Risk Scores	Number of ethnolinguistic groups
1 – Very Low Risk	<=10
2 – Low Risk	>10 and <=25
3 – Moderate Risk	>25 and <=50
4 – High Risk	>50 and <=100
5 – Very High Risk	>100

10) Biodiversity Importance Risk Category

10.1. Freshwater Endemism Risk Indicator

The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World[25] (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 assigned risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Freshwater Endemism Categories	Number of Endemic Fish Species
1 – Very Low Risk	None	no endemics fish species
2 – Low Risk	Low	1-5 endemic fish species
3 – Moderate Risk	Medium	6-10 endemic fish species
4 – High Risk	High	11-25 endemic fish species
5 – Very High Risk	Very High	>25 endemic fish species

[24] 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. Available online: https://terralingua.org/shop/indigenous-and-traditional-peoples-of-the-world-and-ecoregion-conservation/

[25] Fresh Water Ecoregions of the World (FEOW), WWF/TNC (2015) http://www.feow.org/globalmap

10.2. Freshwater Biodiversity Richness Risk Indicator

The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data[20] 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 assigned risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Freshwater Biodiversity Richness Categories	Number of Fish Species
1 – Very Low Risk	Very Low	1 – 20 fish species
2 – Low Risk	Low	21 – 40 fish species
3 – Moderate Risk	Medium	41 – 70 fish species
4 – High Risk	High	71 – 151 fish species
5 – Very High Risk	Very High	>151 fish species

11) Media Scrutiny Risk Category

11.1. National Media Coverage Risk Indicator

This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group)[13]. 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.

Quality of available information varies greatly across countries and regions. WWF & Tecnoma used consistent criteria to turn qualitative research into quantitative risk indicators and scores. The risk categories shown in the Table below are based on the assumption that businesses face higher reputational risks when operating in countries with higher local/national media coverage reporting on water-related issues.

Water Risk Filter Risk Scores	National Media Coverage Categories	Frequency of National Media Coverage
1 – Very Low Risk	Never	None
2 – Low Risk	Rarely	>1 year
3 – Moderate Risk	Occasionally	>1 per 6 months
4 – High Risk	Frequently	>1 per month
5 – Very High Risk	Permanent	> per week

11.2. Global Media Coverage Risk Indicator

This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group)[13]. 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.

Quality of available information varies greatly across countries and regions. WWF & Tecnoma used consistent criteria to turn qualitative research into quantitative risk indicators and scores. The risk scores categories shown in the Table below are based on the assumption that businesses face higher reputational risks when operating in countries with higher global media coverage reporting on water-related issues.

Water Risk Filter Risk Scores	Global Media Coverage Categories	Frequency of Global Media Coverage
1 – Very Low Risk	Never	None
2 – Low Risk	Rarely	>1 year
3 – Moderate Risk	Occasionally	>1 per 6 months
4 – High Risk	Frequently	>1 per month
5 – Very High Risk	Permanent	> per week

12) Conflict Risk Category

12.1. Conflict News Events Risk Indicator

This risk indicator is based on 2018 data collected by RepRisk[26] 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.

WWF partnered with RepRisk to classify the data set into 5 risk score categories based on percentage of negative news for all industries, as shown in the Table below.

Water Risk Filter Risk Scores	Conflict Categories	Percentage of Negative News
1 – Very Low Risk	No reported corporate conflicts	0%
2 – Low Risk	Low conflict potential	<25%
3 – Moderate Risk	Moderate conflict potential	<50%
4 – High Risk	High conflict potential	<75%:
5 – Very High Risk	Very high conflict potential	>75%

In addition to the main conflict risk indicator, the following sub-indicators are included in the Water Risk Filter 5.0: 12.1.1. Water Scarcity; 12.1.2 Local Pollution; 12.1.3 Overuse and wasting of resources; 12.1.4 Impact on community; 12.1.5 Impact on ecosystem landscape.

12.2. Hydro-political Risk Indicator

This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018)[27]. More specifically, it is based on the results of spatial modelling Farinosi et al. (2018) that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues.

[26] RepRisk & WWF (2019). Due diligence database on ESG and business conduct risks. https://www.reprisk.com/

[27] 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.

In the model by Farinosi et al. (2018), historical cross-border water interactions were used as indicators of the magnitude of corresponding water joint-management issues. These were correlated with information about river basin freshwater availability, climate stress, human pressure on water resources, socioeconomic conditions (including institutional development and power imbalances), and topographic characteristics.

The raw data set from Farinosi et al. (2018) study was obtained in a grid-cell level of 27 km resolution and aggregated into Hydrosheds level 7. WWF assigned risk score categories as shown in the Table below.

Water Risk Filter Risk Scores	Hydro-political Risk Scores
1 – Very Low Risk	<= 0.15
2 - Low Risk	> 0.15 and <= 0.3
3 – Moderate Risk	>0.3 and <= 0.4
4 – High Risk	>0.4 and <=0.5
5 – Very High Risk	> 0.5

1.2. Local Basin Risk Indicators

In addition to the global level water risk data sets, WWF has developed and integrated several higher resolutions data sets into the Water Risk Filter 5.0 to provide country-specific local risk indicators for conducting risk assessment at a finer scale. The local risk indicator framework and weighting structure remains the same as for the global risk indicators but, where possible, it draws on a number of better quality and more-up-to-date nationally available data sets. For more information on the local data sets, please check the Data & Methods tab in the Water Risk Filter 5.0.

The spatial base-layer used to inform the risk assessment and map visualization for the local basin risk indicators is the HydroSHEDS HydroBasins Level 12, which is the finest resolution available for the HydroSHEDS data set. For further information on HydroSHEDS, please visit www.hydrosheds.org.

The Water Risk Filter 5.0 currently has local data sets available for the following countries and regions: Great Britain; South Africa; Brazil; Colombia; Spain; Greater Mekong countries (Thailand, Vietnam, Laos, Cambodia); Hungary. In the upcoming years, additional local data sets will gradually be integrated into the Water Risk Filter 5.0.

Since the higher resolution data sets use different metrics, unit and scales, it is important to note that assessments of water risk using higher resolution data will not be directly comparable with assessments made of sites in other countries. For example, if a site in South Africa scores a 3 for water risk, this does not mean that the site has the same level of risk as a site scoring a 3 in Spain. We suggest that the higher resolution data be used to assess portfolios of sites that fall entirely in the specific high resolution country (or region) of interest and it should not be used to make inter-comparisons between different countries (or regions).

When sites are entered into the Water Risk Filter, the user can select whether to use global data sets or the higher resolution data. For businesses with a large number of operations or suppliers both across the world and in countries with high resolution data available, separate assessments should be made: individual assessment for only sites in each specific country of interest using higher resolution data available and a separate assessment with all sites across the world using the global data set.

2.0. Operational Water Risk Assessment

A site's operational-related risk exposure is based on its proprietary characteristics as a water user. Operational water risk is assessed by filling in the Water Risk Filter Operational Risk Questionnaire, which is completed site-by-site. The questionnaire was developed through an iterative stakeholder consultation process in order to capture most important aspects of operational water risk.

In the 5.0 version, users can now choose to conduct a rapid or full assessment for each site location entered. All answers to the (short or full version) questionnaire can be saved to allow the user to return and complete the questionnaire at another time. The operational risk questionnaire can also be sent –as an offline Microsoft Excel sheet, to another user, for example a plant manager, who can then enter the information directly and send it back for upload. Whether through the online environment or offline, the answers to the questionnaire can be saved and uploaded for a single or multiple sites.

2.1. Operational Risk Questionnaire & Framework

The framework of the operational risk questionnaire is aligned to the basin risk assessment framework and contains a similar three-level hierarchy as illustrated in Table 2: 1) risk type, 2) risk category, 3) risk indicator.

The detailed assessment questionnaire contains 22 risk indicator questions whereas the rapid assessment questionnaire consists of only 10 risk indicator questions, both covering all three risk types: Physical, Regulatory and Reputational. However, the operational risk section does not have complete coverage of all of the risk categories. Specifically, under Physical Risk it is restricted to Scarcity and Quality, under Regulatory Risk it is restricted to Enabling Environment (Laws & Policy) and Institutions & Governance, and under Reputational Risk it is restricted to Media Scrutiny and Community Conflict.

In addition, the detailed assessment contains some additional operational data questions (i.e., non-risk indicator questions) which do not influence the risk scores but can help better assess and prioritize operations across a portfolio of sites by exploring issues of materiality.

While the short version questionnaire will provide a rapid operational risk assessment, the higher the quality of input data, the better quality the assessment output will be. Therefore, users are encouraged to complete the full version questionnaire in the long-term for more comprehensive operational risk assessment results.

Lastly, both the short and full version questionnaires also contain an additional 15 operational response questions that also do not influence the operational risk scores, but do influence the set of recommended response actions in the **RESPOND** section. These questions are automatically populated based on CDP data industry-specific results. Users can, and are encouraged to, customize their answers to these questions as this information improves the relevance of the recommended response actions based on their water stewardship maturity level.

The operational risk assessment is based on the same aggregation principles and risk scoring levels as the basin risk assessment. In other words, the operational risk score varies according to the same 1-to-5 classification organized as follows:

1) No or very limited risk;
2) Limited risk;
3) Some risk;
4) High risk;
5) Very high risk.

The results of the operational risk indicators are aggregated into risk categories which inform the overall risk scores for the 3 risk types: Physical, Regulatory and Reputational. The final overall operational risk score is aggregated based on the 3 risk type scores.

Similar to the basin risk assessment, each operational risk indicator, risk category and risk type have weightings which are industry-specific. The Water Risk Filter 5.0 contains default industry-specific weightings for a total of 25 industry categories (see Appendix 2 for detailed information on the default weightings for each industry). The default industry-specific weightings are based on multiple stakeholder consultations and peer reviews with experts from different NGOs, academics, financial institutions and businesses. The weights are also informed by CDP Water Security data from 2013-2017. The user can change the default industry-specific weightings to refine the risk assessment based on their expert opinion and risk perception using the 'Tailor Weightings' button in the **Analyse Risk** tab.

The specific risk indicators in the operational risk section were developed and selected in two phases. In the first phase (2012-2017), the indicators were established based on multiple stakeholder consultations and peer reviews with experts from different NGOs, academics, financial institutions and businesses. With version 5.0 (2018-present), adjustments were made to the indicators based on a combination of alignment to the 2018 CDP Water Security Questionnaire, as well as feedback from corporate users and WWF experience in working with users over the years. In addition to the global version, efforts are currently underway to develop tailored versions of the Operational Risk Questionnaire for specific sectors. Additional details on the methodology behind these versions will be added to future versions of this document once complete.

Table 2. Three-level hierarchy of the operational risk questionnaire framework: risk type, category and indicator.

Risk type	Risk category	# Operational question	# Short version operational questions	Risk indicator
Physical Risk	Quantity/Scarcity	O1	i	O1 - Form of water consumption
		O2	ii	O2 - Importance of water in operations
		O3		O3 - Historical issues with shared water challenges
		O4		O4 - Total water withdrawn (approximate)
		O4a		*O4a - Specific water withdrawal*
		O4b		*O4b - Fresh surface water withdrawal*
		O4c		*O4c - Brackish surface water withdrawal*
		O4d		*O4d - Groundwater withdrawal*
		O4e		*O4e - Seawater / ocean water withdrawal*
		O4f		*O4f - Produced / process water withdrawal*
		O4g		*O4g - Third-party water withdrawal*
		O5		O5 - Total water discharged (approximate)

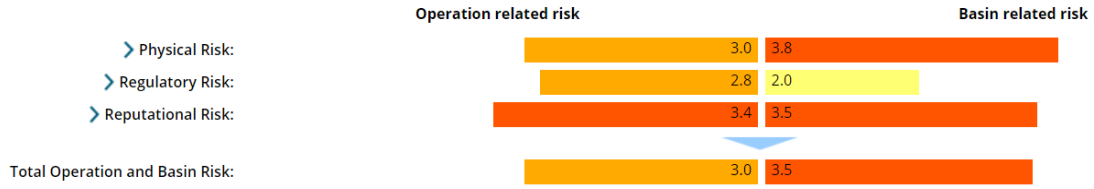
		O5a		*O5a - Specific water discharge*
		O5b		*O5b - Discharge to fresh surface water*
		O5c		*O5c - Discharge to brackish water*
		O5d		*O5d - Discharge to groundwater*
		O5e		*O5e - Discharge to seawater/ocean water*
		O5f		*O5f - Discharge to long term storage*
		O5g		*O5g - Discharge to third-party*
		O6		O6 - Water-intensive energy source dependence
	Quality	O7		O7 - Total wastewater discharged into environment
		O8	iii	O8 - Treatment requirements - before use
		O9	iv	O9 - Treatment requirements - prior to discharge
		O10		O10 - Toxic chemicals used or stored on site
		O11	v	O11 - Ability to impact downstream water quality
Regulatory Risk	**Enabling Environment**	O12	vi	O12 - Regulatory scrutiny facing site
		O13		O13 - Planned regulatory changes
	Institutions and governance	O14	vii	O14 - Quality standards compliance
		O15		O15 - Historical penalties or fines
		O15a		*O15a - Amount of fines/penalties*
		O16		O16 - Presence and participation in basin stakeholder water user platform
Reputational Risk	**Media scrutiny**	O17		O17 - Local media exposure
		O18		O18 - Global media exposure
	Community conflict	O19	viii	O19 - Relative water use of site within basin (User/Polluter)
		O20	ix	O20 - Local brand recognition
		O21	x	O21 - Water stewardship maturity
		O22		O22 - Involvement in water disputes with others
Other	Operational data	O23		O23 - Importance of the site to the company
		O24		O24 - Annual production volume
		O25		O25 - Production unit
		O26		O26 - Approximate production value
		O26a		*O26a - Specific production value*
		O27		O27 - Currency
		O28		O28 - Number of employees
		O29		O29 - Comments
Respond	Expenditure	R1	xi	R1 - CAPEX expenditure
		R2	xiii	R2 - OPEX expenditure
	Stewardship	R3	xiii	R3 - Disclosure level
		R4	xiv	R4 - Awareness & capacity level
		R5	xv	R5 - Business planning level
		R6	xvi	R6 - Collective action level
		R7	xvii	R7 - Internal & external water governance level
		R8	xviii	R8 - Technological / infrastructure implementation level
		R9	xix	R9 - Performance management level
		R10	xx	R10 - Internal water policy & standards level
		R11	xxi	R11 - External water policy & standards level
		R12	xxii	R12 - Water risk awareness level
		R13	xxiii	R13 - Stakeholder engagement level
		R14	xxiv	R14 - Supply chain engagement level
		R15	xxv	R15 - Climate change scenario and resilience planning

3.0. Water Risk Assessment Results

In the **Analyse Risk** tab, users can analyse both basin and operation-related risks using various visualization types (i.e., maps, graphs and tables), illustrated in Figure 1 and 2. A comprehensive overall water risk assessment result is obtained when both basin and operational risk assessment have been fully conducted. However, results can be obtained by only conducting a basin risk assessment and through all stages of completion of the operational risk assessment.

Using the facility filter, water risks results for any given facility (or portfolio of facilities) can be analysed at different levels such as per country, basin, sector, risk indicator and score. In addition, risk results can be amended by the user if better information is available or the user has a different view of the risk level applicable for a specific risk indicator.

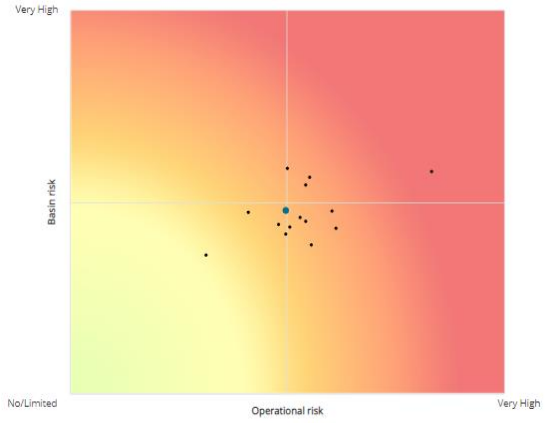
Figure 1. Example of a facility risk chart aggregated basin and operational risk scores.



The results in the risk chart in Figure 1 are compiled at the Risk Type level using the selected facility scores, weighted by industry (per Appendix 1). Each of the Risk Types can also be selected to look at the Risk Categories within a given Risk Type.

Drawing on the total Operational and Basin Risk scores, results can also be visualized via a matrix (Figure 2), which displays sites along two axes (Basin Risk & Operational Risk). By hovering over any given point, the user can review the site name, as well as total basin and operational risk scores.

Figure 2. Example of portfolio matrix representing the Basin and Operational related risks



In addition to the two example visualization types in Figure 1 and Figure 2, water risk assessment results can be represented under other visualization types including as a table, map and graph. Please click on the 'Visualization Type' button at the bottom of the screen to see the full list of options to analyse your risk assessment results.

B. Water Risk Filter: Respond Section

After analysing the water risk assessment results, the Water Risk Filter is able to dynamically link these results for any given site (or a portfolio of sites) to a customized set of mitigation responses actions within the RESPOND section.

This section of the Water Risk Filter 5.0 was developed out of WWF's experience working with sites and companies who were either unclear on how to proceed with the assessment results, or who were selecting responses to their water risks that did not align/match with their water risk exposure. Accordingly, a system was developed to dynamically recommend responses for the assessed risk exposure. While we recognize that global data sets are not always sufficiently accurate to be prescriptive in dictating response actions, it is our belief that the Respond section offers a strong starting point for guiding contextually appropriate actions, which can then be further refined and informed based on local data, knowledge and expertise.

This chapter describes the Respond section of the Water Risk Filter and is organized around each of the key components that underpin the Respond section. It introduces the components of the Respond section and an overview of the logic behind how the results of a risk assessment are combined to generate a set of recommended contextual risk actions - based on the outputs of their unique water risks. The chapter also touches upon how these various response actions are structured around, and draw upon, established water stewardship frameworks and resources.

4.0. Water Stewardship Levels

The Water Risk Filter's Respond section is underpinned by three levels of water stewardship maturity levels to enable the tool to assign more appropriate-level actions to a user. In other words, by accounting for a site's water stewardship sophistication, the tool can limit the range of responses and eliminate those that are likely beyond the user's ability to implement at this point. This helps to improve the relevance of the actions that are recommended back to a user. The three levels of water stewardship that are built into the Respond section are as follows:

i) **Initial actions:** Actions that are typically taken by users who are starting to identify their water-related risks and are usually focused on building internal knowledge and understanding of water.

ii) **Established water management:** Actions that are typically taken by users who are working to adapt to their water-related risks or are new to water stewardship and are usually focused on taking initial internal water stewardship actions.

iii) **Advanced water stewardship practices**: Actions that are typically taken by leading water stewards to mitigate their water-related risks using a combination of internal action and external collaboration/engagement or advocacy.

While WWF often employs a five-step ladder of progression, the decision was made to simplify this into three broad categories. Each of the above stewardship levels have been aligned with 5 established water stewardship frameworks. Below is an illustration of how this alignment:

	Initial actions *(new to water)*	Established water management *(new to water stewardship)*	Advanced water stewardship practices *(leading practice)*
General focus of level	**Water risk identification:** internal, knowledge & understanding	**Water risk adaptation:** internal, initial action	**Water risk mitigation:** External, collaboration/engagement, advocacy
Alliance for Water Stewardship Standard Steps	Response actions primarily are **INTERNALLY** focused and involve **COMMITMENT** to developing internal water capacity through **GATHERING** and **UNDERSTANDING** data	Response actions build off of earlier steps, but are primarily **INTERNALLY** focused around **CORE** elements of **PLANNING, IMPLEMENTING, EVALUATING** and **COMMUNICATING/DISCLOSING**	Response actions are primarily **EXTERNALLY** focused around **ADVANCED** elements of **PLANNING, IMPLEMENTING, EVALUATING** and **COMMUNICATING/DISCLOSING**
WWF Water Stewardship Ladder	Response actions are primarily **INTERNALLY** focused on developing **WATER AWARENESS** & the **KNOWLEDGE OF THE IMPACTS** of water risk (dependencies & liabilities)	Response actions are still primarily **INTERNALLY** focused, covering earlier steps but with a stronger emphasis on **INTERNAL ACTION** that could support risk mitigation	Response actions cover earlier steps with a stronger emphasis on more **EXTERNAL** focus and include **COLLECTIVE ACTION** and **INFLUENCING GOVERNANCE**
Sustainable Development Goals (Goal 6 - Water)	Response actions are **INTERNALLY** focused on developing *knowledge* of **WASH** (6.1 & 6.2), **QUALITY** (6.3), **EFFICIENCY** (6.4) and **MANAGEMENT** (6.5)	Response actions are **INTERNALLY** focused on *implementing* **WASH** (6.1 & 6.2), addressing **QUALITY** (6.3), **EFFICIENCY** (6.4), **MANAGEMENT SYSTEMS/INTERNAL GOVERNANCE** (6.5 & 6.a), and issues that potentially impact freshwater **ECOSYSTEMS** (6.6)	Response actions are **EXTERNALLY** focused on *implementing* **WASH** (6.1 & 6.2), addressing **QUALITY** (6.3), **SCARCITY** (6.4), influencing external **WATER GOVERNANCE SYSTEMS/IWRM** (6.5 & 6.a), and postively impacting freshwater **ECOSYSTEMS** (6.6) through stakeholder **ENGAGEMENT** (6.b) and collective action
Ceres AquaGauge Categories	Response actions are **INTERNALLY** focused around developing RISK awareness (**MEASUREMENT**) and POLICY/STANDARD, BUSINESS PLANNING and GOVERNANCE development (**MANAGEMENT**)	Response actions are **INTERNALLY** focused around DATA GATHERING (**MEASUREMENT**), POLICY/STANDARD, BUSINESS PLANNING and GOVERNANCE implementation (**MANAGEMENT**), educating internal staff (**ENGAGEMENT**) and internal disclosure (**DISCLOSURE**)	Response actions are **EXTERNALLY** focused around DATA GATHERING and RISK ASSESSMENTS (**MEASUREMENT**), POLICY/STANDARD and GOVERNANCE lobbying (**MANAGEMENT**), engaging with external stakeholders (**ENGAGEMENT**) and public disclosure (**DISCLOSURE**)
Conservation Measures Partnership (adapted)	Response actions are **INTERNALLY** focused around *developing knowledge* of water **PROTECTION** and **MANAGEMENT** by engaging in **EDUCATION AND AWARENESS**, understanding local **LAWS and POLICIES** and basics of local **ECONOMICS**	Response actions are **INTERNALLY** focused around *implementing responses* for water **PROTECTION** and **MANAGEMENT** by delivering internal **EDUCATION AND AWARENESS**, conformance audits against local **LAWS and POLICIES.**	Response actions are **EXTERNALLY** focused on engaging in wider ecosystem **PROTECTION** and **MANAGEMENT** by supporting and engaging in external **EDUCATION AND AWARENESS**, engaging in public **LAWS and POLICY** discussions and/or advocacy and delivering/measuring wider **ECONOMIC** impacts of actions

The user self-selects where they fall in this maturity continuum.

5.0. Water Stewardship Actions

The database of water stewardship actions are the backbone of the Respond section. This section outlines how each action was developed, its links to key water stewardship frameworks and the attributes that have been used to categorise each action.

5.1. Water Stewardship Frameworks

When the Respond section began to take form, it was critical to acknowledge that there were already well used and established water stewardship standards, platforms, guidance, tools, etc. (collectively referred to as frameworks), that collectively provided a rich source of potential contextual actions that a user could take. As such, the starting point for the development of the actions within the Respond section came from these frameworks. Below is a list of some of the main ones that were used in this process:

(A) Alliance for Water Stewardship Standard: This standard is a globally-applicable framework that supports major water users in understanding their water use and impacts and provides a framework of sequential criteria that a site can work through. The criteria within the standard have been used as a foundation for many of the water stewardship actions within the Respond section.

(B) CDP Water Security Questionnaire: CDP produces a questionnaire each year that motivates for the disclosure of environmental impacts by using the power of investors and customer. Some of the area of disclosure the questionnaire enquires about have been converted into actions that could be implemented at a site level.

(C) Ceres Aqua Gauge: An excel-based tool developed by Ceres that allows investors to scorecard a company's water management activities against detailed definitions of leading practice. Some of these assessment areas have been modified into actions for the Respond section of the Water Risk Filter.

(D) Sector-specific frameworks: While still in development, the Respond section will be working to add sector-specific actions. These actions will cover water stewardship actions that deal with a specific water issue facing that sector. In these cases, sector-specific frameworks or standards will be reviewed and water stewardship actions will be extracted from these to create a list of bespoke sector actions.

(E) CEO Water Mandate Water Stewardship Toolkit: Curated by the CEO Water Mandate, the Toolkit provides a hub of links to the latest tools, guidance, case studies, datasets and more that can be used to supplement any water stewardship program. While no specific actions have been developed using this data, the Respond section within the Water Risk Filter has aligned its action with the Categories within the Toolkit, making it easy for a user to access more relevant supplementary materials and guidance in the CEO Water Mandate Water Stewardship Toolbox for each action.

These frameworks were selected because they are all (A) well-established and commonly deployed, (B) seek to be comprehensive in their coverage of water stewardship (i.e., are not limited to a select dimension), and (C) have both actions and a taxonomy to organize actions. Accordingly, these water stewardship frameworks were employed both as a source of actions, but also to inform the groupings of actions seen in the Respond section.

5.2. Tags Assigned to Water Stewardship Actions

Each water stewardship action within the Respond section has been assigned a set of attributes (or tags). In most cases, these tags were informed by the frameworks, and indeed have been linked to the respective frameworks (i.e., any given response action in the tool is tagged with the relevant reference from each of the different frameworks). Tags were also assigned beyond just the frameworks (e.g., who was implementing the action – a site or a supporting entity, like staff at a corporate headquarters). Tags were assigned by WWF staff, and tagged response actions were then provided to the organizations who authored the respective stewardship framework (e.g., AWS, CDP, Ceres, etc.) for review. Note that the current tagging may not reflect the agreed perspective of the framework owner as not all organizations provided feedback to WWF. Accordingly, tagging of frameworks should not be treated as approved, nor endorsed, by the organizations linked to the tags.

This tagging assists users on several fronts. First, these tags help to ensure common understanding of actions. Second, these tags can be harnessed by the user via filters to refine which actions are presented as recommendations. Third, the tags also enable the user to identify specific, additional information about each action via the framework references. The main tag attributes used within the Respond section are described below:

Categories

The Respond section makes use of ten categories and allow a user to view what actions are being recommended with respect to a category of water stewardship activities. The categories were formed through a hybrid of the CEO Water Mandate's Water Stewardship Toolbox, CDP's Aqua Gauge and WWF's experience.

These ten categories are:

1) Water awareness and internal capacity
2) Strategy and business planning
3) Collective action
4) Disclosure and reporting
5) Water Governance
6) Operations, performance measurement & management
7) Policies, standards and plans
8) Risk awareness
9) Stakeholder engagement
10) Value chain engagement

Risk type

The Water Risk Filter uses three categories of risk, namely: Physical, Regulatory and Reputational (see Water Risk Filter: Assess Section above). Each of the action is tagged according to what type of water risk it can be used to address. In some cases, for more general water stewardship actions, more than one risk type may be assigned.

Implementer

Where an action is implemented is also important to know. Some actions can be implemented at a site level, but some actions can only be implemented at a corporate level. As there may be different types of users viewing the recommendations provided by the Water Risk Filter, each action in the Respond section is tagged according to which part of an organisation it might be most appropriate to implement an action.

Stewardship level

As per the description above (see Section 4 above), each action within the Respond section is assigned a water stewardship level. In some cases, an action from a framework has been broken into three with an increasing level of complexity. This enables the creation of three versions of the same action that can be applied at different levels of maturity. These attributes are crucial to the Respond section has it allows the recommended actions to customised to better respond to and build on the actions that a site is already taking.

AWS Criteria

As per the description above (see Section 5.1 above), each action within the Respond section has been tagged to the Water Stewardship framework it was derived from to allow a user to find more detailed information regarding how to implement an action. In particular, the AWS Standard (version 2.0) was tagged and can be used as a filter.

Sustainable Development Goal (SDG) 6 Targets

This tag allows a user to identify how the recommended actions could be linked back to the UN Sustainable Development Goals (SDGs). For SDG6, all of the targets have been included as potential

attributes that can be assigned to the actions within the Respond section. While not usable as a filter, additional, relevant other SDG links have been tagged to the actions as well.

Resilience

A resilience tag was added to help users select activities that are denoted to assist with enhancing resilience. This classification was undertaken in this version by WWF staff, but in time will be linked to additional resilience frameworks as suitable ones become available.

In addition to the tagging that can be used for filtering (those noted above), several other tags were employed that cannot be used to filter, but do appear when actions are selected. Furthermore, there are also additional tags that do not appear in the online version of the Respond section, but are available in an offline version.

Water Stewardship framework (see above)

In addition to AWS, other water stewardship frameworks are tagged to actions (see section 5.1. above), though these other frameworks cannot be used as a filter. Each action also includes the specific reference number used by the water stewardship standard to make it even easier for users to find the additional information they need.

Offline version - Sector-specific recommendations

The development of the response actions within the Respond section have been done in a sector-neutral way by drawing on established water stewardship frameworks. However, WWF has already had requests from users to begin to develop more sector-specific water stewardship actions that can be added into the Respond section. Currently these are being developed as discrete projects as they are requested, but built out on a sector-by-sector basis. A similar logic to developing the actions is used to develop these sector-specific actions with the foundations of the response actions, as well as attribute tagging, being drawn from sector-specific standards or guidance relating to taking action on water issues that may be more applicable to a certain sector. For example, an apparel & textiles sector-specific version is being developed that will reference back to materials from the Sustainable Apparel Coalition and its HIGG Index.

As these response actions are developed, they are also tagged using the above mentioned attribute types. The benefits of these sector-specific actions is that they offer users within these sectors a wider array of potential recommendations based on their water risk assessments that are also more sector-specific.

5.3. Action Recommendation Logic

The logic that underpins what actions are recommended to a user is described in this section. The Respond section recommendations are primarily driven by considering the **type of basin risks that a site is facing** and **how the site is or is not working to respond to these risks**.

5.3.1. Triggering Actions

The Respond section uses three factors to trigger any given response action recommendation to a user. The triggering logic for each action within the Respond section is unique and draws on either one, two or all of the factors described below to ensure that the described action is most suited to supporting a site respond to its unique water risk conditions. The trigger logic is primarily run at a site level, allowing the tool to create bespoke recommendations for individual sites that respond to that site's unique basin risks and operational water stewardship maturity. However, some triggers also

occur at the portfolio level to reflect the aggregate needs of an array of sites for those who have a responsibility to provide water stewardship support responses to multiple sites. Note that in all cases, at present, triggers are *only tied to the global basin data sets* and not the high resolution data.

Water risk Indicator conditions (site level)

The first of these triggering factors, which is the main triggering mechanism, is the use of conditional formulas to test if the combination of the site's Basin Risk or Operational Risk scores have exceeded a preassigned threshold for that given response action. The Respond section uses a combination of **AND/OR** statements to achieve this and the tool has the ability to use up to **four** Basin or Operational risk indicator scores within this conditional logic.

Sectors (site level)

Certain actions within the Respond section are more applicable to certain sectors. As such, the tool has the functionality to assign sector(s) into the triggering logic for an action.

Triggering frequency (portfolio level)

This is the only factor within the triggering logic that is done at a Portfolio level and is applied to actions that are most commonly implemented at a corporate level. This functionality allows for the addition of a trigger to require a certain percentage of all the sites to have an action triggered before it shows up as a recommendation.

For example, for a given site, an action such as "install efficient irrigation" may be triggered by the conditional logic of a certain scarcity score (basin risk indicator) AND drought score (basin risk indicator) AND sector (operational risk indicator) AND water use need score (operational risk indicator). Likewise, if a certain percentage of sites also meet the conditions that trigger that same action, then a portfolio level action (for corporate implementers) may be triggered (e.g., help sites secure financing for irrigation equipment).

5.3.2. Prioritisation of Recommendations

In addition to the triggering of an action (a binary of "yes" or "no"), there was also the need to help prioritize the different actions that are triggered in the system. The general logic in terms of prioritization was to guide users towards actions that were most needed (based on a combination of existing risk response and risk exposure) and those that were most appropriate (based on a combination of level of water stewardship versus the complexity level of the action). This prioritization is also undertaken using a conditional formula, which assigns scores for each of the following aspects and then totals and ranks the actions:

Response scores

The first of these ranking factors is the use of the site's response scores, which inform how sophisticated a site is with respect to its general level of water stewardship maturity in a given category (see Section 4. above). The weaker the site's response is for a given action, the higher the ranking, while strong performance lowers the ranking. Scores for this aspect range from 5000 to 1000. This logic is based on the aim to focus on areas of weakness, rather than pushing response actions in areas that are already strong. Note that these responses are auto-populated based on sector selection using averaged and classified CDP response data. Users do have the option (and indeed, are encouraged) to over-ride this information in the system.

Appropriateness for water stewardship level

The second ranking factor is the use of the site's self-assigned water stewardship level versus the action's water stewardship level. This assigns a higher ranking to actions that match the level of the site, while providing a lower ranking to those that are above the site's level, and even lower rankings to actions to actions that are below the site's water stewardship level. Scores for this aspect range from 3000 to 10.

Water Risk Indicator maximum scores

The third aspect that informs the ranking is the use of the maximum of site's actual risk indicator scores. Since every action has at least two conditional triggers, the maximum value is employed and the higher the risk score, the higher the ranking factor is assigned to that action. Scores for this aspect range from 500 to 0.

These three aspects are then aggregated using the scores and ranked to help guide users towards more suitable and needed actions first.

There are several notes that should be considered when reviewing the recommended responses:

1) There are often minor differences in the ranking algorithm and accordingly, users should not read too much into whether an action was ranked as #5 or #6. The bigger relevance is whether it is ranked in the top grouping (say 1-20) versus lower (60-150+).
2) Ultimately, all triggered actions are recommended.
3) Actions are triggered based on data, much of which is global in nature, while actions need to match local conditions. Accordingly, the Generic Response Tool is available to develop a customized version that allows users to filter for needs.

For additional questions about the Water Risk Filter, please email waterriskfilter@wwf.de

APPENDIX 1. Basin Risk Assessment

Table 1. Industry-specific weightings for risk types, categories and indicators.

	Industry	Physical Risk	1. Quantity - Scarcity	2. Quantity - Flooding	3. Quality	4. Ecosystem Service Status	Regulatory Risk	5. Enabling Environment (Policy & Laws)	6. Institutions and Governance	7. Management Instruments	8 - Infrastructure & Finance	Reputation Risk	9. Cultural Importance	10. Biodiversity Importance	11. Media Scrutiny	12. Conflict
		Risk type	Risk category				Risk type	Risk category				Risk type	Risk category			
	Averages	**60%**	**49%**	**20%**	**17%**	**14%**	**20%**	**30%**	**30%**	**25%**	**15%**	**20%**	**16%**	**11%**	**43%**	**30%**
1	**Agriculture (animal products)**	**75%**	55%	15%	20%	10%	**20%**	30%	30%	25%	15%	**5%**	20%	10%	50%	20%
2	**Agriculture (plant products)**	**70%**	70%	10%	5%	15%	**20%**	30%	30%	25%	15%	**10%**	20%	10%	50%	20%
3	Appliances & General Goods Manufacturing	**60%**	35%	25%	20%	20%	**20%**	30%	30%	25%	15%	**20%**	20%	10%	50%	20%
4	Automotive, Electrical Equipment & Machinery Production	**65%**	40%	20%	30%	10%	**15%**	30%	30%	25%	15%	**20%**	20%	10%	40%	30%
5	Chemicals & Other Materials Production	**60%**	35%	20%	30%	15%	**15%**	30%	30%	25%	15%	**25%**	10%	10%	40%	40%
6	Construction Materials	**55%**	55%	25%	5%	15%	**20%**	30%	30%	25%	15%	**25%**	20%	10%	50%	20%
7	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil)	**60%**	65%	10%	15%	10%	**20%**	30%	30%	25%	15%	**20%**	15%	10%	40%	35%
8	**Electric Energy Production – Hydropower**	**65%**	50%	25%	10%	15%	**20%**	30%	30%	25%	15%	**15%**	20%	10%	30%	40%
9	Electric Energy Production - Solar, Wind	**35%**	55%	20%	5%	20%	**35%**	30%	30%	25%	15%	**30%**	10%	20%	30%	50%
10	Electronics & Semiconductor Manufacturing	**65%**	45%	15%	30%	10%	**15%**	30%	30%	25%	15%	**20%**	20%	10%	40%	30%
11	Fishing and aquaculture	**50%**	45%	5%	30%	20%	**30%**	30%	30%	25%	15%	**20%**	20%	10%	30%	40%
12	**Food & Beverage Production**	**70%**	70%	10%	15%	5%	**10%**	30%	30%	25%	15%	**20%**	10%	5%	40%	45%
13	**Food Retailing**	**40%**	50%	20%	20%	10%	**25%**	30%	30%	25%	15%	**35%**	10%	10%	50%	30%
14	General or Speciality Retailing	**45%**	50%	20%	20%	10%	**20%**	30%	30%	25%	15%	**35%**	15%	10%	55%	20%
15	Health Care, Pharmaceuticals and Biotechnology	**65%**	40%	20%	25%	15%	**25%**	30%	30%	25%	15%	**10%**	30%	10%	50%	10%
16	Hospitality Services	**55%**	30%	25%	20%	25%	**15%**	30%	30%	25%	15%	**30%**	20%	10%	40%	30%
17	**Metals & Mining**	**70%**	60%	25%	5%	10%	**5%**	30%	30%	25%	15%	**25%**	5%	15%	40%	40%
18	Oil, Gas & Consumable Fuels	**70%**	65%	20%	5%	10%	**5%**	30%	30%	25%	15%	**25%**	5%	15%	40%	40%
19	**Paper & Forest Product Production**	**70%**	55%	10%	20%	15%	**10%**	30%	30%	25%	15%	**20%**	10%	10%	45%	35%
20	Professional Services, Software, Real Estate, Financial Institutions	**40%**	35%	35%	15%	15%	**40%**	30%	30%	25%	15%	**20%**	15%	5%	60%	20%
21	Telecommunication services (including wireless)	**50%**	50%	25%	10%	15%	**30%**	30%	30%	25%	15%	**20%**	20%	10%	40%	30%
22	**Textiles, Apparel & Luxury Good Production**	**65%**	50%	15%	20%	15%	**15%**	30%	30%	25%	15%	**20%**	20%	10%	50%	20%
23	Transportation Services	**65%**	40%	35%	5%	20%	**20%**	30%	30%	25%	15%	**15%**	20%	10%	40%	30%
24	Water utilities / Water Service Providers	**70%**	40%	20%	25%	15%	**25%**	30%	30%	25%	15%	**5%**	20%	15%	40%	25%
25	Other (cross-sector average)	**60%**	**49%**	**20%**	**17%**	**14%**	**20%**	**30%**	**30%**	**25%**	**15%**	**20%**	**16%**	**11%**	**43%**	**30%**

Table 2. Weightings for each basin risk indicator (not industry-specific). Risk indicator weights for each risk category add up to 100%.

Risk type	Risk category	Risk indicator	Weightings
Physical Risk	1 - Physical: Quantity - Scarcity	1.0 – Aridity	10%
		1.1 - Water Depletion	20%
		1.2 - Baseline Water Stress	20%
		1.3 - Blue Water Scarcity	20%
		1.4 - Projected Change in Water Discharge (by ~2050)	5%
		1.5 - Drought Frequency Probability	20%
		1.6 - Projected Change in Drought Occurrence (by ~2050)	5%
	2 - Physical: Quantity - Flooding	2.1 - Estimated Flood Occurrence	95%
		2.2 - Projected Change in Flood Occurrence (by ~2050)	5%
	3 - Physical: Quality	3.1 - Surface Water Contamination Index	100%
		3.1.1 - Nitrogen loading	
		3.1.2 - Phosphorus loading	
		3.1.3 - Pesticide loading	
		3.1.4 - Soil salination	
		3.1.5 - Organic loading	
		3.1.6 - Sediment loading	
		3.1.7 - Mercury loading	
		3.1.8 - Potential acidification	
	4 - Physical: Ecosystem Service Status	4.1 - Fragmentation Status of Rivers	70%
		4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss)	25%
		4.3 - Projected Impacts on Freshwater Biodiversity	5%
Regulatory Risk	5 - Regulatory: Enabling Environment (Policy & Laws)	5.1 - Freshwater Policy Status (SDG 6.5.1)	35%
		5.2 - Freshwater Law Status (SDG 6.5.1)	55%
		5.3 - Implementation Status of Water Management Plans (SDG 6.5.1)	10%
	6 - Regulatory: Institutions and Governance	6.1 - Corruption Perceptions Index	50%
		6.2 - Freedom in the World Index	25%
		6.3 - Business Participation in Water Management (SDG 6.5.1)	25%

	7 - Regulatory: Management Instruments	7.1 - Management Instruments for Water Management (SDG 6.5.1)	70%
		7.2 - Groundwater Monitoring Data Availability and Management	15%
		7.3 - Density of Runoff Monitoring Stations	15%
	8 - Regulatory: Infrastructure & Finance	8.1 - Access to Safe Drinking Water	45%
		8.2 - Access to Sanitation	45%
		8.3 - Financing for Water Resource Development and Management (SDG 6.5.1)	10%
Reputational Risk	9 - Reputational: Cultural Importance	9.1 - Cultural Diversity	100%
	10 - Reputational: Biodiversity importance	10.1 - Freshwater Endemism	50%
		10.2 – Freshwater Biodiversity Richness	50%
	11 - Reputational: Media Scrutiny	11.1 – National Media Coverage	55%
		11.2 – Global Media Coverage	45%
	12 - Reputational: Conflict	12.1 - Conflict News Events	50%
		12.3 - Hydro-political Risk	50%

APPENDIX 2. Operational Risk Assessment

Table 1. Industry-specific weightings for risk types, categories and indicators for full version questionnaire.

		Risk type	Risk category		Risk type	Risk category		Risk type	Risk category	
#	Industry	Physical Risk	Scarcity (Quantity)	Quality	Regulatory Risk	Laws & Policy	Institutions and Governance	Reputational Risk	Media Scrutiny	Community Conflict
1	**Agriculture (animal products)**	75%	73%	27%	20%	50%	50%	5%	35%	65%
2	**Agriculture (plant products)**	60%	93%	7%	25%	50%	50%	15%	35%	65%
3	Appliances & General Goods Manufacturing	60%	64%	36%	20%	50%	50%	20%	35%	65%
4	Automotive, Electrical Equipment & Machinery Production	65%	57%	43%	15%	50%	50%	20%	35%	65%
5	Chemicals & Other Materials Production	60%	54%	46%	15%	50%	50%	25%	35%	65%
6	Construction Materials	50%	92%	8%	20%	50%	50%	30%	35%	65%
7	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil)	60%	81%	19%	20%	50%	50%	20%	35%	65%
8	**Electric Energy Production - Hydropower**	65%	83%	17%	20%	50%	50%	15%	35%	65%
9	Electric Energy Production - Solar, Wind	35%	92%	8%	35%	50%	50%	30%	35%	65%
10	Electronics & Semiconductor Manufacturing	65%	60%	40%	15%	50%	50%	20%	35%	65%
11	Fishing and aquaculture	50%	60%	40%	30%	50%	50%	20%	35%	65%
12	**Food & Beverage Production**	70%	82%	18%	10%	50%	50%	20%	35%	65%
13	**Food Retailing**	40%	71%	29%	25%	50%	50%	35%	35%	65%
14	General or Speciality Retailing	45%	71%	29%	20%	50%	50%	35%	35%	65%
15	Health Care, Pharmaceuticals and Biotechnology	65%	62%	38%	25%	50%	50%	10%	35%	65%
16	Hospitality Services	55%	60%	40%	15%	50%	50%	30%	35%	65%
17	**Metals & Mining**	65%	92%	8%	5%	50%	50%	30%	35%	65%
18	Oil, Gas & Consumable Fuels	65%	93%	7%	5%	50%	50%	30%	35%	65%
19	Professional Services, Software, Real Estate, Financial Institutions	40%	70%	30%	40%	50%	50%	20%	35%	65%
20	**Paper & Forest Product Production**	65%	73%	27%	15%	50%	50%	20%	35%	65%
21	**Textiles, Apparel & Luxury Good Production**	55%	71%	29%	30%	50%	50%	15%	35%	65%
22	Transportation Services	65%	89%	11%	20%	50%	50%	15%	35%	65%
23	Water utilities / Water Service Providers	70%	62%	38%	25%	50%	50%	5%	35%	65%
24	Telecommunications	50%	90%	10%	30%	50%	50%	20%	35%	65%
25	Other	50%	60%	40%	15%	50%	50%	35%	35%	65%

Table 2. Industry-specific weightings for each operational risk indicator for full version questionnaire. Risk indicator weights for each risk category add up to 100%. Respond questions are listed here but they do not influence the risk assessment; they inform the RESPOND section of the tool.

Risk type	Risk category	# Operational question	# Short version operational questions	Risk indicator	Weighting
Physical Risk	Quantity (Scarcity)	O1	i	O1 - Form of water consumption	10%
		O2	ii	O2 - Importance of water in operations	15%
		O3		O3 - Historical issues with shared water challenges	20%
		O4		O4 - Total water withdrawn (approximate)	25%
		O4a		*O4a - Specific water withdrawal*	
		O4b		*O4b - Fresh surface water withdrawal*	
		O4c		*O4c - Brackish surface water withdrawal*	
		O4d		*O4d - Groundwater withdrawal*	NA
		O4e		*O4e - Seawater / ocean water withdrawal*	
		O4f		*O4f - Produced / process water withdrawal*	
		O4g		*O4g - Third-party water withdrawal*	
		O5		O5 - Total water discharged (approximate)	25%
		O5a		*O5a - Specific water discharge*	
		O5b		*O5b - Discharge to fresh surface water*	
		O5c		*O5c - Discharge to brackish water*	
		O5d		*O5d - Discharge to groundwater*	NA
		O5e		*O5e - Discharge to seawater/ocean water*	
		O5f		*O5f - Discharge to long term storage*	
		O5g		*O5g - Discharge to third-party*	
		O6		O6 - Water-intensive energy source dependence	5%
	Quality	O7		O7 - Total wastewater discharged into environment	10%
		O8	iii	O8 - Treatment requirements - before use	30%
		O9	iv	O9 - Treatment requirements - prior to discharge	25%
		O10		O10 - Toxic chemicals used or stored on site	15%
		O11	v	O11 - Ability to impact downstream water quality	20%
Regulatory Risk	Laws & Policy	O12	vi	O12 - Regulatory scrutiny facing site	30%
		O13		O13 - Planned regulatory changes	70%
	Institutions and Governance	O14	vii	O14 - Quality standards compliance	50%
		O15		O15 - Historical penalties or fines	20%
		O15a		*O15a - Amount of fines/penalties*	NA

		O16		O16 - Presence and participation in basin stakeholder water user platform	30%
Reputational Risk	Media Scrutiny	O17		O17 - Local media exposure	70%
		O18		O18 - Global media exposure	30%
	Community Conflict	O19	viii	O19 - Relative water use of site within basin (User/Polluter)	30%
		O20	ix	O20 - Local brand recognition	30%
		O21	x	O21 - Water stewardship maturity	15%
		O22		O22 - Involvement in water disputes with others	25%
Other	Operational data	O23		O23 - Importance of the site to the company	NA
		O24		O24 - Annual production volume	
		O25		O25 - Production unit	
		O26		O26 - Approximate production value	
		O26a		*O26a - Specific production value*	
		O27		O27 - Currency	
		O28		O28 - Number of employees	
		O29		O29 - Comments	
Respond	Expenditure	R1	xi	R1 - CAPEX expenditure	Informing RESPOND section only
		R2	xiii	R2 - OPEX expenditure	
	Stewardship	R3	xiii	R3 - Disclosure level	
		R4	xiv	R4 - Awareness & capacity level	
		R5	xv	R5 - Business planning level	
		R6	xvi	R6 - Collective action level	
		R7	xvii	R7 - Internal & external water governance level	
		R8	xviii	R8 - Technological / infrastructure implementation level	
		R9	xix	R9 - Performance management level	
		R10	xx	R10 - Internal water policy & standards level	
		R11	xxi	R11 - External water policy & standards level	
		R12	xxii	R12 - Water risk awareness level	
		R13	xxiii	R13 - Stakeholder engagement level	
		R14	xxiv	R14 - Supply chain engagement level	
		R15	xxv	R15 - Climate change scenario and resilience planning	

Table 3. Industry-specific weightings for risk types and categories for short version questionnaire.

		Risk type	Risk category		Risk type	Risk category		Risk type	Risk category	
#	Industry	Physical Risk	Scarcity (Quantity)	Quality	Regulatory Risk	Laws & Policy	Institutions and Governance	Reputational Risk	Media Scrutiny	Community Conflict
1	**Agriculture (animal products)**	75%	73%	27%	20%	50%	50%	5%	0%	100%
2	**Agriculture (plant products)**	60%	93%	7%	25%	50%	50%	15%	0%	100%
3	Appliances & General Goods Manufacturing	60%	64%	36%	20%	50%	50%	20%	0%	100%
4	Automotive, Electrical Equipment & Machinery Production	65%	57%	43%	15%	50%	50%	20%	0%	100%
5	Chemicals & Other Materials Production	60%	54%	46%	15%	50%	50%	25%	0%	100%
6	Construction Materials	50%	92%	8%	20%	50%	50%	30%	0%	100%
7	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil)	60%	81%	19%	20%	50%	50%	20%	0%	100%
8	**Electric Energy Production - Hydropower**	65%	83%	17%	20%	50%	50%	15%	0%	100%
9	Electric Energy Production - Solar, Wind	35%	92%	8%	35%	50%	50%	30%	0%	100%
10	Electronics & Semiconductor Manufacturing	65%	60%	40%	15%	50%	50%	20%	0%	100%
11	Fishing and aquaculture	50%	60%	40%	30%	50%	50%	20%	0%	100%
12	**Food & Beverage Production**	70%	82%	18%	10%	50%	50%	20%	0%	100%
13	**Food Retailing**	40%	71%	29%	25%	50%	50%	35%	0%	100%
14	General or Speciality Retailing	45%	71%	29%	20%	50%	50%	35%	0%	100%
15	Health Care, Pharmaceuticals and Biotechnology	65%	62%	38%	25%	50%	50%	10%	0%	100%
16	Hospitality Services	55%	60%	40%	15%	50%	50%	30%	0%	100%
17	**Metals & Mining**	65%	92%	8%	5%	50%	50%	30%	0%	100%
18	Oil, Gas & Consumable Fuels	65%	93%	7%	5%	50%	50%	30%	0%	100%
19	Professional Services, Software, Real Estate, Financial Institutions	40%	70%	30%	40%	50%	50%	20%	0%	100%
20	**Paper & Forest Product Production**	65%	73%	27%	15%	50%	50%	20%	0%	100%
21	**Textiles, Apparel & Luxury Good Production**	55%	71%	29%	30%	50%	50%	15%	0%	100%
22	Transportation Services	65%	89%	11%	20%	50%	50%	15%	0%	100%
23	Water utilities / Water Service Providers	70%	62%	38%	25%	50%	50%	5%	0%	100%
24	Telecommunications	50%	90%	10%	30%	50%	50%	20%	0%	100%
25	Other	50%	60%	40%	15%	50%	50%	35%	0%	100%

Table 4. Industry-specific weightings for operational risk indicators for short version questionnaire. The risk indicator weightings add up to 100% for each risk category. Respond questions are listed here but they do not influence the risk assessment; they inform the RESPOND section of the tool.

Risk type	Risk category	# Operational question	# short version operational questions	Risk indicator	Weighting
Physical Risk	Scarcity (Quantity)	O1	i	O1 - Form of water consumption	45%
		O2	ii	O2 - Importance of water in operations	55%
	Quality	O8	iii	O8 - Treatment requirements - before use	40%
		O9	iv	O9 - Treatment requirements - prior to discharge	30%
		O11	v	O11 - Ability to impact downstream water quality	30%
Regulatory Risk	Laws & Policy	O12	vi	O12 - Regulatory scrutiny facing facility	100%
	Institutions and Governance	O14	vii	O14 - Quality standards compliance	100%
Reputational Risk	Community Conflict	O19	viii	O19 - Relative water use of site within basin (User/Polluter)	40%
		O20	ix	O20 - Local brand recognition	40%
		O21	x	O21 - Water stewardship maturity	20%
Respond	Expenditure	R1	xi	R1 - CAPEX expenditure	Informing RESPOND section only
		R2	xiii	R2 - OPEX expenditure	
	Stewardship	R3	xiii	R3 - Disclosure level	
		R4	xiv	R4 - Awareness & capacity level	
		R5	xv	R5 - Business planning level	
		R6	xvi	R6 - Collective action level	
		R7	xvii	R7 - Internal & external water governance level	
		R8	xviii	R8 - Technological / infrastructure implementation level	
		R9	xix	R9 - Performance management level	
		R10	xx	R10 - Internal water policy & standards level	
		R11	xxi	R11 - External water policy & standards level	
		R12	xxii	R12 - Water risk awareness level	
		R13	xxiii	R13 - Stakeholder engagement level	
		R14	xxiv	R14 - Supply chain engagement level	
		R15	xxv	R15 - Climate change scenario and resilience planning	