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 website https://waterriskfilter.panda.org/

Contents

Check out the tutorial How to use the WWF Water Risk Filter

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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 framework follows a three-level hierarchy: 1) risk **type**, 2) risk **category**, 3) risk **indicator**, and the aggregation of those three levels together is referred as the **Overall Risk**. This structure was put in place for the following 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, water 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.

Whilst the Overall Risk comprehends physical, regulatory and regulatory risks, each of the three risk types comprises four risk categories, and are intended to cover the following aspects:

A) **Physical**: represents both natural and human-induced conditions of river basins. It comprises the risk categories: 1) Scarcity, 2) Flooding, 3) Water Quality, and 4) Ecosystem Services Status. Therefore, physical risks account for if water is too little, too much, unfit for use, and/or the surrounding ecosystems are degraded, and in turn, negatively impacting water ecosystem services.

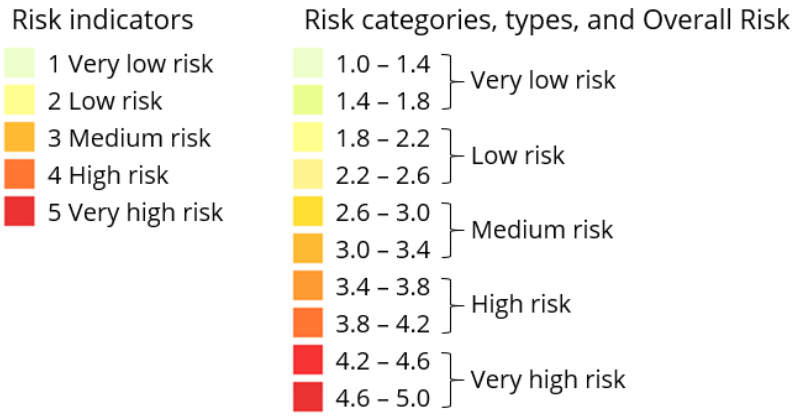
[1] The CEO Water Mandate – Driving Harmonization of Water-Related Terminology, Discussion Paper, September 2014, https://ceowatermandate.org/files/MandateTerminology.pdf

B) **Regulatory**: Regulatory water risk is heavily tied to the concept of good governance and that businesses thrive in a stable, effective and properly implemented regulatory environment. It is aligned to the UN Sustainable Development Goal Target 6.5 (SDG 6.5.1) framework and the OECD water governance framework[2], and comprises the risk categories: 5) Enabling Environment (largely concerned with laws & policies), 6) Institutions & Governance (concerned with the ability to convene and engage), 7) Management Instruments (concerned with data & enforcement), and 8) Infrastructure & Finance (concerned with whether funds are accessible to build critical water-related infrastructure)[3].

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. Reputational risk represents stakeholder's and local communities' perceptions on whether companies conduct business in a sustainable or responsible fashion with respect to water. It comprises the risk categories: 1) Cultural Importance (of water to local communities), 10) Biodiversity Importance (freshwater biodiversity), 11) Media Scrutiny (coverage of water-related issues), and 12) Conflict (risk of hydro-political conflicts in the river basins).

Altogether the Water Risk Filter Version 5.0 contains a total of 32 basin risk indicators (see Table 1) which are based predominantly on freely available external, peer-reviewed data sets (see section 1.1. 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. Raw data sets are first spatially aggregated to a common scale, of river basins (i.e. watersheds), and then subsequently classified into a 1-to-5 value (i.e. risk scores). This normalization process creates a series of basin risk indicators out of the raw data sets, and allows for indicators to be aggregated with other indicators in the same risk category and/or to be compared between indicators.

The risk score classification is consistent throughout all risk indicators, categories, types as well as in the overall risk. However, indicators' risk scores are given as integers, while aggregated risk scores (categories, types and the Overall Risk) can have decimals:



[2] OECD Principles on Water Governance, May 2015 http://www.oecd.org/cfe/regional-policy/OECD-Principles-on-Water-Governance.pdf

[3] 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.

Aggregated risk scores are computed as applying industry-specific weightings. 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 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.

The same process is employed for the higher resolution risk data sets (see section 1.2. for detailed information on high resolution local 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 - Quantity - Scarcity	1.0 – Aridity Index 1.1 - Water Depletion 1.2 - Baseline Water Stress 1.3 - Blue Water Scarcity 1.4 - Available Water Remaining (AWARE) 1.5 - Drought Frequency Probability 1.6 - Projected Change in Drought Occurrence
	2 - Quantity - Flooding	2.1 - Estimated Flood Occurrence 2.2 - Projected Change in Flood Occurrence
	3 - Water Quality	3.1 - Surface Water Quality Index *3.1.1 - BOD* *3.1.2 - Electrical Conductivity* *3.1.3 - Nitrogen*
	4 - Ecosystem Services Status	4.1 - Fragmentation Status of Rivers 4.2 - Catchment Ecosystem Services Degradation Level 4.3 - Projected Impacts on Freshwater Biodiversity
Regulatory Risk	5 - 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 - Institutions & 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 - Management Instruments	7.1 - Management Instruments for Water Management (SDG 6.5.1) 7.2 - Groundwater Monitoring Data Availability and Management 7.3 - Density of Runoff Monitoring Stations
	8 - 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 - Cultural Importance	9.1 - Cultural Diversity
	10 - Biodiversity Importance	10.1 - Freshwater Endemism 10.2 – Freshwater Biodiversity Richness
	11 - Media Scrutiny	11.1 – National Media Coverage 11.2 – Global Media Coverage
	12 - Conflict	12.1 - Conflict News Events 12.2 - Hydro-political Likelihood

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 raw 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.

HydroBASINS is a series of polygon layers that depict watershed boundaries and sub-basin delineations at a global scale, based on SRTM Digital Elevation Models. 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.

Table 2: Level of spatial aggregation for basin risk indicators

Basin Risk indicator	Native format	Aggregation
1.0 – Aridity Index	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 - Available Water Remaining (AWARE)	Polygon	HydroBASIN Level 7
1.5 - Drought Frequency Probability	Grid	HydroBASIN Level 7
1.6 - Projected Change in Drought Occurrence	Grid	HydroBASIN Level 7
2.1 - Estimated Flood Occurrence	Polygon	HydroBASIN Level 7
2.2 - Projected Change in Flood Occurrence	Grid	HydroBASIN Level 7
3.1 - Surface Water Quality Index	Grid	HydroBASIN Level 7
4.1 - Fragmentation Status of Rivers	Polyline	HydroBASIN Level 6
4.2 - Catchment Ecosystem Services Degradation Level	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	Country boundaries	Country boundaries
12.2 - Hydro-political Likelihood	Grid	HydroBASIN Level 7

[4] Lehner, B., Grill G. (2013): Global river hydrography and network routing: baseline data and new approaches to study the world's large river systems. Hydrological Processes, 27(15): 2171–2186. Data is available at www.hydrosheds.org

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 Index	Infrequent	2019	September 2020
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 - Available Water Remaining (AWARE)	No updating	2018	September 2020
1.5 - Drought Frequency Probability	Monthly	2020	September 2020
1.6 - Projected Change in Drought Occurrence	No updating	2018	May 2018
2.1 - Estimated Flood Occurrence	Continuously	2020	September 2020
2.2 - Projected Change in Flood Occurrence	No updating	2018	May 2018
3.1 - Surface Water Quality Index	No updating	2019	September 2020
4.1 - Fragmentation Status of Rivers	No updating	2019	May 2019
4.2 - Catchment Ecosystem Services Degradation Level	Monthly	2020	September 2020
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	2020	September 2020
6.2 - Freedom in the World Index	Annual	2020	September 2020
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	2019	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	Monthly	2020	September 2020
12.2 - Hydro-political Likelihood	No updating	2018	April 2019

1.1.1. Physical Risk Type

The Water Risk Filter physical risk represents both natural and human-induced conditions of river basins. It is composed of four risk categories covering different aspects of physical risks: scarcity, flooding, water quality, and ecosystem services status. Therefore, physical risks account for if water is too little, too much, unfit for use, and/or the surrounding ecosystems are degraded, and in turn, negatively impacting water ecosystem services.

1) Quantity – Scarcity Risk Category

Water scarcity refers to the physical abundance or lack of freshwater resources which can result in significant impacts to business such as production/supply chain disruption, higher operating costs and growth constraints. Water scarcity is human-driven, and it is generally calculated as a function of the volume of water use/demand relative to the volume of water available in a given area. However, water scarcity does not consider whether water is accessible and/or fit for use, as defined by the UN Global Compact CEO Water Mandate (2014).

The Water Risk Filter risk category scarcity is a comprehensive and robust metric as it integrates a total of 7 best available and peer-reviewed datasets covering different aspects of scarcity as well as different modelling approaches: aridity, water depletion, baseline water stress, blue water scarcity, available water remaining, drought frequency probability, and projected change in drought occurrence. See the specific risk indicator below for more details:

1.0. Aridity Index

The second version of the Global Aridity Index (Trabucco & Zomer 2019)[5] is a global climate data for the 1970-2000 period, related to evapotranspiration processes and rainfall deficit for potential vegetative growth, based on the implementation of a Penman-Montieth Reference Evapotranspiration (ET0) equation. It provides information about the potential availability of water in regions with low water demand, thus they are used to better account for deserts and other arid areas in the risk assessment.

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. The Water Risk Filter applied UNEP's classification scheme for the 5 risk score classes for the aridity risk indicator as shown in the Table below.

Water Risk Filter Risk Scores	Aridity Index Classes	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

[5] Trabucco, A., & Zomer, R. Global Aridity Index and Potential Evapotranspiration (ET0) Climate Database v2. figshare. Fileset (2019). https://doi. org/10.6084/m9. figshare, 7504448, v3. https://cgiarcsi.community/2019/01/24/global-aridity-index-and-potential-evapotranspiration-climate-database-v2/

1.1. Water Depletion

The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016)[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. The 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 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 classes, the Water Risk Filter classified the water depletion risk indicator into the 5 risk score classes presented in the Table below.

Water Risk Filter Risk Scores	Water Depletion Classes	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%

1.2. Baseline Water Stress

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.

The Water Risk Filter classified the Baseline Water Stress data set into the same 5 risk score classes as shown in the Table below.

Water Risk Filter Risk Scores	Baseline Water Stress Classes	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%

[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. http://www.earthstat.org/water-depletion-watergap3-basins/

[7] Hofste, R., Kuzma, S., Walker, S., … & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute. https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data

1.3. Blue Water Scarcity

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

The Water Risk Filter classified the Mekonnen and Hoekstra (2016) blue water scarcity data set into 5 risk score classes 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. Available Water Remaining (AWARE)

The Available Water Remaining (AWARE)[9] quantifies the potential of water deprivation, to either humans or ecosystems, and serves in calculating the impact score of water consumption in Life Cycle Assessments or to calculate a water scarcity footprint as per ISO 14046. It is based on the available water remaining in a given basin relative to the world average, after human and aquatic ecosystem demands have been met.

The Water Risk Filter used the AWARE annual weighted average and classified it into 5 risk score classes, e.g. into 5 quantiles (no data excluded), as shown in the Table below.

Water Risk Filter Risk Scores	AWARE annual weighted average
1 – Very Low Risk	<=0.43%
2 – Low Risk	>0.43% and <= 2.03%
3 – Moderate Risk	>2.03% and <= 8.48%
4 – High Risk	>8.48% and <= 46.47%
5 – Very High Risk	>46.47%

1.5. Drought Frequency Probability

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

[8] Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323. https://advances.sciencemag.org/content/2/2/e1500323

[9] Boulay, A. M., Bare, J., Benini, L., Berger, M., Lathuillière, M. J., Manzardo, A., ... & Ridoutt, B. (2018). The WULCA consensus characterization model for water scarcity footprints: assessing impacts of water consumption based on available water remaining (AWARE). The International Journal of Life Cycle Assessment, 23(2), 368-378. http://www.wulca-waterlca.org/aware.html

[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. https://spei.csic.es/index.html

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 2010 - May 2020) as reference period.

With this approach, the Water Risk Filter 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 classes, as shown in the Table below.

Water Risk Filter Risk Scores	Relative Frequency 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%

1.6. Projected Change in Drought Occurrence

This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP)[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. The Water Risk Filter classified the results into 5 risk score classes for the projected change in drought occurrence risk indicator, as shown in the Table below.

Water Risk Filter Risk Scores	Projected Change in Drought Occurrence Classes: 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

Flooding is when there is an overflowing of water onto land that is normally dry. Floods can happen due to overflowing rivers, lakes, or oceans, and are often caused by heavy rainfall, rapid snowmelt, when dams or levees break, or a storm surge from a tropical cyclone or tsunami in coastal areas.

[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. https://www.geosci-model-dev.net/10/4321/2017/

Flood events can impact businesses' operations as well as across their value chain by causing closure of operations, supply chain disruptions and transportation or increased capital costs.

The Water Risk Filter risk category flooding considers historical patterns and future trends. The historical patterns are based on empirical evidence of large flood events since 1985 to present, derived from a wide variety of news, governmental, instrumental, and remote sensing sources. Future trends are based on ensemble projections that applies both global climate and hydrological models to compute projected changes in magnitude of floods in a 2°C scenario.

2.1. Estimated Flood Occurrence

This risk indicator is based on empirical evidence of large flood events since 1985 to 2020, registered by the Dartmouth Flood Observatory's Global Active Archive of Large Flood Events[12]. It includes floods due to overflowing rivers, lakes, or oceans, and caused by heavy rainfall, rapid snowmelt, dams or levees break, or storm surge from tropical cyclones or tsunami in coastal areas. The data is derived from a wide variety of news, governmental, instrumental, and remote sensing sources.

The Water Risk Filter has incorporated the Dartmouth Flood Observatory data set as applying the count of flood events in the full period and classifying it into 5 risk score classes as shown in the Table below.

Water Risk Filter Risk Scores	Estimated Flood Occurrence Classes
1 – Very Low Risk	No severe floods
2 – Low Risk	1 – 2 severe floods
3 – Moderate Risk	3 – 10 severe floods
4 – High Risk	11 – 35 severe floods
5 – Very High Risk	>35 severe floods

2.2. Projected Change in Flood Occurrence

This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP)[13]. The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Results are expressed in terms of change (%) in probability between pre-industrial and 2°C scenarios.

WWF partnered with Potsdam Institute for Climate Impact Research to develop the underlying data described above. The Water Risk Filter classified the results into 5 risk score classes for the projected change in flood occurrence risk indicator, as shown in the Table below.

[12] Brakenridge, G. R. (2020). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado. http://floodobservatory.colorado.edu/Archives/index.html

[13] Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development. https://www.geosci-model-dev.net/10/4321/2017/

Water Risk Filter Risk Scores	Projected Change in Occurrence of Floods Classes: 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

Water quality indicates whether water resources is fit for human use and ecosystems alike. Poor water quality – water pollution – can impact business indirectly by causing ecosystems destabilization or serious health issues as well as directly through increased operating costs as well as reduction in production or growth.

The Water Risk Filter risk category water quality considers parameter with well documented direct and indirect negative effects on water security for both humans and freshwater biodiversity, which are aligned to the Sustainable Development Goal (SDG) 6.3.2: biological oxygen demand (BOD) as a widely used umbrella proxy for overall water quality; electrical conductivity (EC) as proxy for salinity balance and pH alteration; and nitrogen, to capture nutrient loading in water bodies.

3.1. Surface Water Contamination Index

This risk indicator is based on a combination of monitoring data and a Machine Learning prediction model, and is composed of three water quality parameter with well documented direct and indirect negative effects on water security for both humans and freshwater biodiversity, which are aligned to the Sustainable Development Goal (SDG) 6.3.2: biological oxygen demand (BOD) as a widely used umbrella proxy for overall water quality; electrical conductivity (EC) as proxy for salinity balance and pH alteration; and nitrogen, to capture nutrient loading in water bodies. This Surface Water Quality Index[14] was produced by the World Bank as stacking the BOD, EC, and nitrogen after each parameter was normalized to a common scale and range.

The Water Risk Filter classified the World Bank's Surface Water Quality Index data into 5 risk score classes, e.g. by the 20th, 40th, 70th, and 90th percentiles, as shown in the Table below.

Water Risk Filter Risk Scores	Surface Water Quality Index Classes
1 – Very Low Risk	Index <= -1.66
2 – Low Risk	Index > -1.66 and <= -0.79
3 – Moderate Risk	Index > -0.79 and <= 1.24
4 – High Risk	Index > 1.24 and <= 5.22
5 – Very High Risk	Index > 5.22

In addition to the risk indicator 3.1 Surface Water Quality Index, the three underlying water quality parameters are included as sub-risk indicators.

[14] Damania, R., Desbureaux, S., Rodella, A. S., Russ, J., & Zaveri, E. (2019). Quality unknown: The invisible water crisis. The World Bank. https://openknowledge.worldbank.org/handle/10986/32245

4) Ecosystem Services Status Risk Category

Ecosystems provide business—as well as people and communities—with a wide range of goods and services such as climate and streamflow regulation, water purification, species habitats maintenance, balance of soil biodiversity, pests and diseases, among many others. Therefore, the degradation of ecosystems can result in business having restricted access in the long-term to the quantity and quality of water needed for their activities as well as other ecosystem services they rely on.

The Water Risk Filter risk category ecosystem services status is informed by indicators of fragmentation status of rivers, i.e. Connectivity Status Index (CSI); catchment degradation, i.e. forest loss, as forests play an important role in terms of water regulation, supply and pollution control; and projected change in freshwater fish extinction.

4.1. Fragmentation Status of Rivers

This risk indicator is based on the data set by Grill et al. (2019)[15] mapping the world's free-flowing rivers. This data is a compilation of 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 used the HydroBASINS level 6 basins and all river reaches of order <= 8 in the Grill et al. (2019) 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 classes, as shown in the Table below.

Water Risk Filter Risk Scores	Fragmentation status Classes
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

For this risk indicator, forest 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[16]. The authors defined trees as vegetation taller than 5 meters

[15] Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215. https://figshare.com/articles/Mapping_the_world_s_free-flowing_rivers_data_set_and_technical_documentation/7688801

[16] 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. http://earthenginepartners.appspot.com/science-2013-global-forest

in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2019.

The Water Risk Filter used the HydroBASINS level 7 basins to calculate the percentage of forest cover loss within basins, and the result was further classified it into 5 risk score classes, as shown in the Table below.

Water Risk Filter Risk Scores	Catchment Ecosystem Services Degradation Classes	Percentage of Forest Cover Loss
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%

4.3. Projected Impacts on Freshwater Biodiversity

The study by Tedesco et al. (2013)[17] 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.

The Water Risk Filter classified the data into 5 risk score classes as shown in the Table below.

Water Risk Filter Risk Scores	Projected Impacts on Freshwater Biodiversity Classes	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

[17] Tedesco, P. A., Oberdorff, T., Cornu, J. F., Beauchard, O., Brosse, S., Dürr, H. H., ... & Hugueny, B. (2013). A scenario for impacts of water availability loss due to climate change on riverine fish extinction rates. Journal of Applied Ecology, 50(5), 1105-1115. http://atlas.freshwaterbiodiversity.eu/atlasApp/full/?map=3.2.1-fish-extinction-rates-climate-change

1.1.2. Regulatory Risk Type

The Water Risk Filter regulatory risk is heavily tied to the concept of good governance and that businesses thrive in a stable, effective and properly implemented regulatory environment. It is aligned to the UN Sustainable Development Goal Target 6.5 (SDG 6.5.1) framework and is composed of four risk categories: enabling environment, institutions & governance, management instruments, and infrastructure & finance.

The Water Risk Filter 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), which is measured on a scale of zero to 100, based on the degree of implementation using 33 questions in a self-assessed country questionnaire.

5) Enabling Environment (Policy & Laws) Risk Category

Enabling environment is a measure of existing policies, laws and plans to support IWRM implementation. Instable, ineffective and poorly implemented enabling environment can potentially undermine business viability.

The Water Risk Filter risk category enabling environment is informed by SDG 6.5.1 indicators: freshwater policy status (i.e. national water resources policy); freshwater law status (i.e. national water resources law(s)); and implementation status of water management plans (i.e. national IWRM plans).

5.1. Freshwater Policy Status (SDG 6.5.1)

This risk indicator is based on SDG 6.5.1. "National Water Resources Policy" indicator[18], which corresponds to one of the three national level indicators under the enabling environment category.

The Water Risk Filter classified the SDG 6.5.1. "National Water Resources Policy" indicator scores into the 5 risk score classes presented in the Table below.

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

[18] UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation. https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./

5.2. Freshwater Law Status (SDG 6.5.1)

This risk indicator is based on SDG 6.5.1. "National Water Resources Law(s)" indicator[19], which corresponds to one of the three national level indicators under the enabling environment category.

The Water Risk Filter classified the SDG 6.5.1. "National Water Resources Law(s)" indicator scores into the 5 risk score classes 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)

This risk indicator is based on SDG 6.5.1. "National IWRM plans" indicator[20], which corresponds to one of the three national level indicators under the enabling environment category.

The Water Risk Filter classified the SDG 6.5.1. "National IWRM plans" indicator scores into the 5 risk score classes 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 & Governance Risk Category

Institutions & Governance is a measure of the range and roles of political, social, economic and administrative institutions, and the ability to convene and engage other stakeholder groups that help to support IWRM implementation. Instable and ineffective institutions & governance can potentially undermine business viability.

The Water Risk Filter risk category institutions & governance is informed by three indicators: the corruption perceptions index; the freedom in the world index; and the SDG 6.5.1 indicator on business participation in water management.

[19] 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./

[20] UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation. https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./

6.1. Corruption Perceptions Index

This risk Indicator is based on the latest Transparency International's data: The Corruption Perceptions Index 2019[21]. 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.

The Water Risk Filter classified the Transparency International's Corruption Perceptions Index into 5 risk scores classes, as shown in the Table below.

Water Risk Filter Risk Scores	Corruption Perceptions Index Classes	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

This risk indicator is based on Freedom House (2020)[22], an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2020 edition involved more than 125 analysts and more than 40 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 15 territories from January 1, 2019, through December 31, 2019.

The Water Risk Filter used Freedom House data's aggregated score, and further classified it into 5 risk scores classes, as shown in the Table below.

Water Risk Filter Risk Scores	Freedom Status Classes	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 (SDG 6.5.1)

This risk indicator is based on SDG 6.5.1. "Business Participation in Water Resources Development, Management and Use" indicator[23], which corresponds to one of the six national level indicators under the institutions and participation category.

[21] Transparency International (2020). Corruption Perceptions Index 2019. Berlin: Transparency International. https://www.transparency.org/files/content/pages/2019_CPI_Report_EN.pdf
[22] Freedom House (2020). Freedom in the world 2020. Washington, DC: Freedom House. https://freedomhouse.org/sites/default/files/2020-02/FIW_2020_REPORT_BOOKLET_Final.pdf
[23] 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./

The Water Risk Filter classified the SDG 6.5.1. "Business Participation in Water Resources Development, Management and Use" indicator scores into the 5 risk score classes 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

Management instruments is a measure of data availability, tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions that help to support Integrated Water Resources Management (IWRM) implementation. Ineffective and poorly implemented management instruments can potentially undermine business viability.

The Water Risk Filter risk category management instruments is informed by three indicators: Sustainable Development Goal (SDG) 6.5.1 indicator on sustainable and efficient water use management; groundwater monitoring data availability and management; and density of runoff monitoring stations.

7.1. Management Instruments for Water Management (SDG 6.5.1)

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" indicator[24], which corresponds to one of the five national level indicators under the management instruments category.

The Water Risk Filter classified the SDG 6.5.1. "Sustainable and efficient water use management" indicator scores into the 5 risk score classes 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

[24] UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation. https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651./

7.2. Groundwater Monitoring Data Availability and Management

This risk indicator is based on the data set by UN IGRAC (2019)[25] to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. 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.

The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data. This risk indicator considers only groundwater level monitoring (quantitative monitoring) as currently there is no sufficient information to compile it considering also groundwater quality monitoring networks.

Water Risk Filter Risk Scores	Groundwater Monitoring Data Availability and Management Classes
1 – Very Low Risk	National groundwater monitoring programmes, that provide data for NGOs and processed information suitable for non-experts
2 – Low Risk	Some national programmes and limited data availability
3 – Moderate Risk	Some national programmes and no data availability
4 – High Risk	Limited national programmes and no data availability
5 – Very High Risk	No or very limited national programmes and no data availability

7.3. Density of Runoff Monitoring Stations

The density of monitoring stations for water quantity was applied as proxy to develop this risk indicator. The Global Runoff Data Base[26] was used to estimate the number of monitoring stations per 1000km^2 of the main river system (data base access date: May 2018).

The Water Risk Filter classified the results into 5 risk scores classes, as shown in the Table below.

Water Risk Filter Risk Scores	Monitoring Density Classes	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	Up to 1 monitoring station
5 – Very High Risk	No monitoring data in basin	No stations

[25] 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

[26] BfG (2019). Global Runoff Data Base. German Federal Institute of Hydrology (BfG). https://www.bafg.de/GRDC/EN/01_GRDC/13_dtbse/database_node.html

8) Infrastructure & Finance Risk Category

Infrastructure & Finance is a measure of access to clean water and sanitation as well as of existing budgeting and financing made available and used for water resources development and management. Low financing for water resources development and water infrastructure can potentially undermine business viability.

The Water Risk Filter risk category infrastructure & finance is informed by three indicators: percentage of population with access to safe drinking water; access to basic sanitation services; and the Sustainable Development Goal (SDG) 6.5.1 indicator on financing for water resource development and management.

8.1. Access to Safe Drinking Water

This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data[27]. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.

The Water Risk Filter used the proportion of population using at least basic drinking water services, by country, and further classified it into 5 risk score classes, 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%
4 – High Risk	Low	>60% and <=80%
5 – Very High Risk	Very low	<=60%

8.2. Access to Sanitation

This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data[28]. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.

The Water Risk Filter used the 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.

[27] 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

[28] 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

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)

The 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[29].

The Water Risk Filter classified the SDG 6.5.1. "Financing" indicator scores into the 5 risk score classes 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

[29] 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./

1.1.3. Reputational Risk Type

The Water Risk Filter reputational risk represents stakeholder's and local communities' perceptions on whether companies conduct business in a sustainable or responsible fashion with respect to water. It is composed of four risk categories: cultural importance of water to local communities, freshwater biodiversity importance, media scrutiny/coverage of water-related issues, and risk of hydro-political conflicts in the river basins. See the specific risk category layers for more details.

9) Cultural Importance Risk Category

Water is a social and cultural good for local communities, indigenous and traditional people in their daily life, religion and culture. Businesses can potentially face reputational risk if a cultural good is perceived as negatively impacted or violated.

The Water Risk Filter risk category cultural importance considers the diversity of ethnolinguistic groups globally, as a proxy of cultural diversity.

9.1. Cultural Diversity

Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture.

This risk indicator is based on the WWF & Terralingua work (Oviedo et al. 2000)[30], 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.

The Water Risk Filter used the number of ethnolinguistic groups by country as a proxy to cultural diversity, and further classified it into 5 risk scores classes, 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

[30] 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/

10) Biodiversity Importance Risk Category

Biodiversity importance indicates whether a basin is home to a rich, diverse and healthy ecosystem. Businesses operating in basins of high biodiversity importance are likely to be exposed to higher reputational risks.

The Water Risk Filter risk category biodiversity importance is informed by two indicators from the WWF and TNC work Freshwater Ecoregions of the World (FEOW): freshwater endemism, and freshwater biodiversity richness.

10.1. Freshwater Endemism

The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC [31]. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.

The Water Risk Filter classified the FEOW data into 5 risk scores classes, as shown in the Table below.

Water Risk Filter Risk Scores	Freshwater Endemism Classes	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

10.2. Freshwater Biodiversity Richness

The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC[32]. 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.

The Water Risk Filter classified the FEOW data into 5 risk scores classes, as shown in the Table below.

Water Risk Filter Risk Scores	Freshwater Biodiversity Richness Classes	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 – 150 fish species
5 – Very High Risk	Very High	>150 fish species

[31] WWF & TNC (2015). Freshwater Ecoregions of the World. http://www.feow.org/

[32] WWF & TNC (2015). Freshwater Ecoregions of the World. http://www.feow.org/

11) Media Scrutiny Risk Category

Media scrutiny indicates how aware stakeholders and local communities typically are about water-related issues due to national and international media coverage. Businesses can potentially face reputational risk when operating in countries with high media coverage.

The Water Risk Filter risk category media scrutiny is informed by two indicators developed by WWF and Tecnoma: one representing national coverage, and one representing international (global) coverage.

11.1. National Media Coverage

This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter). For more information, please check the **Country Profiles** tab in the **EXPLORE** section.

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 Classes	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

This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware people are of water-related issues due to global media coverage. Familiarity to and media coverage of the region and regional water-related disasters are taken into account. For more information, please check the **Country Profiles** tab in the **EXPLORE** section.

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 Classes	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

Conflict indicates whether there has been documented negative news (e.g. incidents, criticism and controversies) that can affect a company's reputational risk as well as historical political conflicts due to competition over limited water resources.

The Water Risk Filter risk category is informed by two indicators: RepRisk's country weighted score of negative news; and an index of hydro-political issues magnitude.

12.1. Conflict News Events

This risk indicator is based on 2019 data collected by RepRisk[33] 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.

The Water Risk Filter used the RepRisk data of countries' weighted score (sum of all sectors and impacts) into 5 risk score classes, as shown in the Table below.

Water Risk Filter Risk Scores	RepRisk Country Weighted Score
1 – Very Low Risk	<=33
2 – Low Risk	>33 and <= 102
3 – Moderate Risk	>102 and <= 364
4 – High Risk	>364 and <= 3200
5 – Very High Risk	>3200

[33] RepRisk & WWF (2020). Due diligence database on ESG and business conduct risks. RepRisk. https://www.reprisk.com/

12.2. Hydro-political Likelihood

This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018)[34]. More specifically, it is based on the results of spatial modelling that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues. In the modelling, 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 Water Risk Filter classified Farinosi et al. (2018) data into 5 risk score classes, 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

[34] Farinosi, F., Giupponi, C., Reynaud, A., Ceccherini, G., Carmona-Moreno, C., De Roo, A., ... & Bidoglio, G. (2018). An innovative approach to the assessment of hydro-political risk: A spatially explicit, data driven indicator of hydro-political issues. Global environmental change, 52, 286-313. https://doi.org/10.1016/j.gloenvcha.2018.07.001

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; and Chile. Europe will be available later in 2021. 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 1: 1) risk type, 2) risk category, 3) risk indicator.

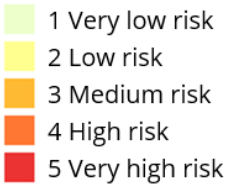
The detailed assessment questionnaire contains 22 risk indicator questions whereas the rapid assessment questionnaire consists of only 10 risk indicator questions, both covering all three risk types: Physical, Regulatory and Reputational. However, the operational risk section does not have complete coverage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



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)

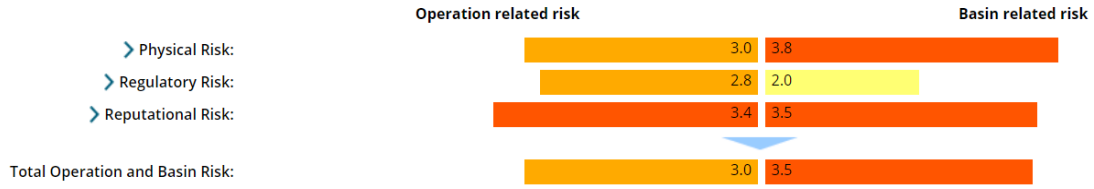
		O5a		*O5a - Specific water discharge*
		O5b		*O5b - Discharge to fresh surface water*
		O5c		*O5c - Discharge to brackish water*
		O5d		*O5d - Discharge to groundwater*
		O5e		*O5e - Discharge to seawater/ocean water*
		O5f		*O5f - Discharge to long term storage*
		O5g		*O5g - Discharge to third-party*
		O6		O6 - Water-intensive energy source dependence
	Water 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	**Policy & Laws**	O12	vi	O12 - Regulatory scrutiny facing site
		O13		O13 - Planned regulatory changes
	Institutions & 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.

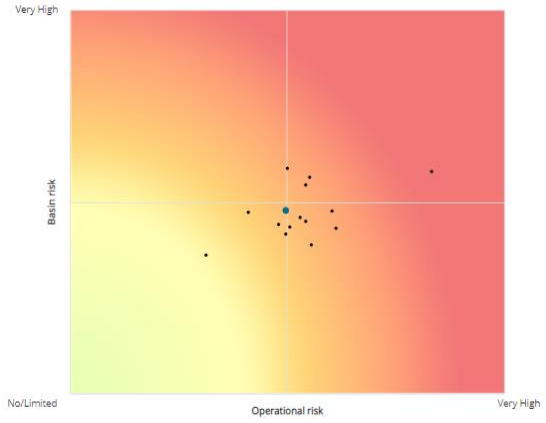
Figure 1. Example of a facility risk chart aggregated basin and operational risk scores.



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

C. APPENDIX 1. Weightings in the Basin Risk Assessment

Table 1. 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 - Quantity - Scarcity	1.0 – Aridity Index	0%
		1.1 - Water Depletion	20%
		1.2 - Baseline Water Stress	20%
		1.3 - Blue Water Scarcity	10%
		1.4 - Available Water Remaining (AWARE)	20%
		1.5 - Drought Frequency Probability	20%
		1.6 - Projected Change in Drought Occurrence	10%
	2 - Quantity - Flooding	2.1 - Estimated Flood Occurrence	95%
		2.2 - Projected Change in Flood Occurrence	5%
	3 - Water Quality	3.1 - Surface Water Quality Index *3.1.1 - BOD* *3.1.2 – Electrical Conductivity* *3.1.3 - Nitrogen*	100%
	4 - Ecosystem Service Status	4.1 - Fragmentation Status of Rivers	70%
		4.2 - Catchment Ecosystem Services Degradation Level	25%
		4.3 - Projected Impacts on Freshwater Biodiversity	5%
Regulatory Risk	5 - 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 - Institutions & 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 - 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 - 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 - Cultural Importance	9.1 - Cultural Diversity	100%
	10 - Biodiversity Importance	10.1 - Freshwater Endemism	50%
		10.2 – Freshwater Biodiversity Richness	50%
	11 - Media Scrutiny	11.1 – National Media Coverage	55%
		11.2 – Global Media Coverage	45%
	12 - Conflict	12.1 - Conflict News Events	50%
		12.3 - Hydro-political Likelihood	50%

Table 2. Industry-specific weightings in the basin risk assessment.

	Industry	Physical Risk	1. Quantity - Scarcity	2. Quantity - Flooding	3. Water Quality	4. Ecosystem Services Status	Regulatory Risk	5. Enabling Environment (Policy & Laws)	6. Institutions & 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%**

D. APPENDIX 2. Weightings in the Operational Risk Assessment

Table 1. Industry-specific weightings for the full version questionnaire.

		Risk type	Risk category		Risk type	Risk category		Risk type	Risk category	
#	Industry	Physical Risk	Quantity - Scarcity	Water Quality	Regulatory Risk	Policy & Laws	Institutions & 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%
	Water 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	Policy & Laws	O12	vi	O12 - Regulatory scrutiny facing site	30%
		O13		O13 - Planned regulatory changes	70%
	Institutions & 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 short version questionnaire.

		Risk type	Risk category		Risk type	Risk category		Risk type	Risk category	
#	Industry	Physical Risk	Quantity - Scarcity	Water Quality	Regulatory Risk	Policy & Laws	Institutions & 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	Quantity - Scarcity	O1	i	O1 - Form of water consumption	45%
		O2	ii	O2 - Importance of water in operations	55%
	Water 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	Policy & Laws	O12	vi	O12 - Regulatory scrutiny facing facility	100%
	Institutions & 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	