

A nighttime photograph of a city skyline, likely Singapore, viewed from across a body of water. The skyline is dominated by several brightly lit skyscrapers, including the Marina Bay Sands hotel with its iconic three towers. In the foreground, a large, classical-style building with many arched windows is illuminated. The water in the foreground is dark, with some small boats visible. The overall scene is a vibrant display of urban architecture at night.

LINKING WATER RISK AND FINANCIAL VALUE – PART III NEW VALUATION TOOL AND DATABASE



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Author: Alexis Morgan (WWF Germany)
Co-Author: Ariane Laporte-Bisquit (WWF Germany)
Contact: Alexis Morgan (WWF Germany)
Acknowledgment: Anna Kalashnyk, Richard Lee, Will Sarni,
Parisa Shahyari, Juliane Vatter, Philipp Wagnitz
Designed by: Silke Roßbach, mail@silke-rossbach.de
Produced by: Maro Ballach (WWF Germany)
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Contents

1	Summary	4
2	The Valuing Water Database	7
2.1	The Valuing Water Database Fields	8
2.1.1	Developers	8
2.1.2	Description	8
2.1.3	Type of Tool	8
2.1.4	Audience	9
2.1.5	Scope of Tool	9
2.1.6	Type of Assessment	9
2.1.7	Accessibility	10
2.2	Tools review: summary of findings	10
3	A new approach to water valuation – The Water And (WAVE) Tool	12
4	Conclusions and recommendations	18

1 Summary

Freshwater is a scarce resource that is under increasing pressure due to competition, policy challenges, and variability driven by growing climate instability. As outlined in Part I of this series, droughts, floods, and other basin water risk drivers are increasingly impacting companies' financial statements and in turn, becoming a growing concern for financial institutions. Part II provided a systematic overview of several existing water valuation tools and highlighted existing gaps.

Responding to the issues raised in Parts I and II, this report focusses on two new valuation-related resources embedded in the WWF Water Risk Filter:

- (1) The Valuing Water Database covers over 100 tools and approaches that can be used to help find the right way to value water; and
- (2) The Water And ValuE (WAVE) tool developed by WWF and Water Foundry Advisors, LLC (Water Foundry), and powered by CDP.

While corporations and financial institutions typically evaluate risk through a specific lens that picks up issues such as physical or market risks, and then translates these into financial impacts, assessments of the value of natural assets can take on different forms.

In “The Value of Water: linking water valuation, water risk and water stewardship” report by WWF and IFC (Morgan & Orr, 2015), it was suggested that water stewardship is a response to water risk that seeks to harness different forms of water value (Figure 1). While the research yielded an array of tools and approaches referring to “valuing water”, none of them tackled financial valuation of water risks in a manner that was consistent with what was envisioned in the report. And no new tools emerged to fully or adequately capture the impact of water risks on investment and loan portfolios. So WWF set about building two new tools.

Launched in November 2019, the Valuing Water Database highlights the array of existing tools and approaches for valuing water. It also reinforces how critical it is to understand which form of value the user is interested in, the target sector and audience, and several other dimensions before one can find the right tool for the job.

Both tools offer financial institutions additional resources to help inform valuation of water

WAVE, with a financial value focus, seeks to go beyond the scarcity/drought focus of existing water valuation tools and address the impacts of floods, disease, and conflicts by drawing upon both probability data and reported water risk event-financial impact linkages, and modelling various scenarios. Moreover, its logic accounts for not only water risk exposure and vulnerability (via both basin and operational risk exposure), but also response, and draws upon empirical data from CDP to power scenarios – making it unique.

After two years of development, WAVE is now in beta mode – ready for financial institutions to work with us so that they can begin to put a value on their water risks. And to collaborate with us to further enhance the tool. WWF and Water FounDry believe WAVE represents the first of a next generation of water valuation tools that will offer financial institutions and companies more extensive knowledge and capabilities to integrate water risk explicitly into decision-making. As tools and data are strengthened, including the liberation of asset level data, and additional computing power, we believe it will be possible to evolve WAVE to cover portfolios more comprehensively and thereby make it more feasible for financial institutions to account for water risk in valuing equities and debt instruments.

Both tools offer financial institutions additional resources to help inform valuation of water risks and will continue to evolve through time.



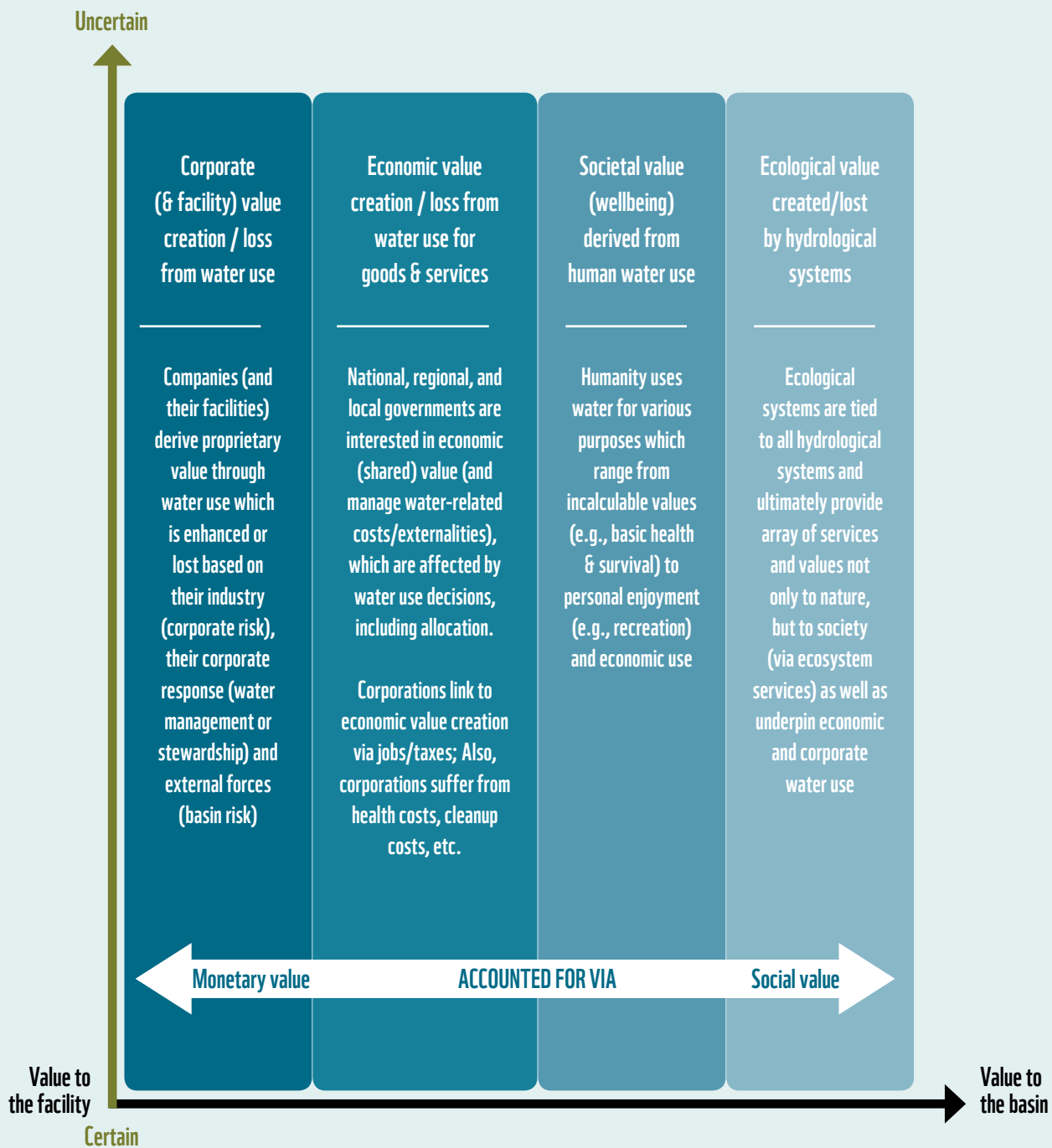


Figure 1: The different forms of valuing water

2 The Valuing Water Database

The Valuing Water Database originated during the publication of the Value of Water report (Morgan & Orr, 2015). However, the database was significantly expanded in 2019 – both in terms of fields as well as the number of tools and approaches, from around 50 to over 100.

The original database was assembled by WWF to document tools that could calculate financial value. However, as work on the Value of Water report emerged and as time passed, it became apparent that not only would it be a valuable resource in the community, but that there was a broader need to cover not only ‘calculators’, but other ‘tools’ and ‘approaches’ ranging from frameworks to methodologies, which are all intended for different purposes within the realm of ‘valuing water’.

Preparation of the drastically expanded Valuing Water Database drew upon several frameworks, guidelines, and reporting initiatives. However, few of these frameworks were restricted to water. Most covered the whole scope of environmental and social risks.

The catalogued tools and approaches were largely limited to those that were developed during the last 15 years. Most of the approaches are freely accessible on the internet. Some are “engagement hubs” intended to link parties, many of which have a large number of followers. It is worth noting that the research indicated that many businesses do not rely solely on one guideline or framework, but upon several at a time.

Ultimately, the purpose of the Valuing Water Database is to ensure that those working in the space of water valuation can more easily navigate the array of tools in the space and access the best tool for the job. Put differently: to enable users to identify the most relevant and suitable approaches and tools to address their needs and interests when it comes to valuing water. By using a database format, it allows users to narrow down the range of suitable tools based on specific parameters of interest. For example, the user can identify which topic, audience, and form of approach is desired, resulting in a short list of tool options.

The aim is that the database will become a living document that is updated and informed by tool developers as new tools emerge and as old tools are retired.

2.1. The Valuing Water Database Fields

The Valuing Water Database is now embedded in the WWF Water Risk Filter's Value section. The database is structured around a series of fields, each of which can be used to identify the desired form of tool – developers, description, type of tool, audience, scope of tool, type of assessment, and accessibility.

2.1.1 Developers

With over 100 tools, the database allows users to track who the developers of the tools are, where they are based, and when the tool was published. These three sub-fields are searchable by organization name, country, and publication year respectively.

2.1.2 Description

This field offers users the ability to review the developers own descriptions of their respective tool(s). The “Focus Area” field denotes whether the tool has a specific thematic focus area. For example, many of the tools listed have a focus on biodiversity or ecosystem services. Similarly, the Water Specificity field is a binary field allowing the user to identify only those tools that are “water-specific”. These fields display the area(s) for which the tool specialises in (if relevant) and whether the tool could be used for assessing other environmental and social matters.

2.1.3 Type of Tool

As noted earlier, the tools and approaches manifest in a variety of different formats. The type of tool field distinguishes between:

- Calculator – a tool with a calculation function;
- Engagement Hub – network organisation, might have own consultations for just members;
- Methodology/Guideline – documents with detailed methodologies;
- Databases: Repositories of data, often quantitative information, maps, etc.;

- Reports – one-time document with an analysis or description of some assessment approaches;
- Excel file – a separate standing file with building-in functions to perform an assessment; and
- Software – a separate programme which requires installation.

2.1.4 Audience

This field identifies the best suitable user audience(s) for each tool: company level (single facility, whole business, investor), public sector (government), or civil society (including NGOs). In other words, it is all about who the tool is best suited for, regardless of which sector the tool focuses on.

2.1.5 Scope of Tool

This provides information about the targeted sector, whether value is calculated for present or future value, and the geographic scope of each tool. More specifically, in contrast to the Audience field, which focuses on the audience for the tool, the targeted sector field indicates whether the tool could be applied to evaluate all business sectors or just specific ones. In other words, whether or not the tool is intended to assess a specific sector. For example, if the tool is intended to be used by the banking sector to evaluate the mining sector, then the primary audience would be banking, while the targeted sector would be mining. The Past/Present/Future value field allows users to identify whether the value being assessed is past value (already affected), present value (currently affected), or future value (potentially affected). Lastly, the geographic scope covers whether the tool is intended for global applicability, or whether it has a restricted geographic focus (e.g., a specific country). Those with global applicability are denoted with “global”, while specific country focuses are listed by country names.

2.1.6 Type of Assessment

Building off of the broad framing employed by Morgan & Orr (2015), the form of value denotes the tool’s focus on a certain form of water value: social/spiritual, socio-economic, or financial. It also provides information about whether the tool generates qualitative and/or quantitative outputs.

2.1.7 Accessibility

All tools are denoted as either “Free” or “Paid” or “Request”. While most tools are freely accessible, some require special membership or paid subscription in order to obtain comprehensive results. Nevertheless, several of the paid tools still offer free access to some case studies, so even without paying, they may be of interest to users. The tools and approaches are also denoted by whether they are accessible online or offline, although virtually all have some form of online accessibility.

2.2 Tools review: summary of findings

In addition to compiling the data, the tools and approaches within the Valuing Water Database were also reviewed to provide some general findings regarding the existing tools. Several conclusions can be drawn from an initial assessment of the database:

- 1) There has been a recent proliferation of tools, which began around 2007 (7), and peaked around 2015 (10)/ 2016 (11), before slowing somewhat in recent years 2017 (7), 2018 (7), and 2019 (5). This growth suggests that civil and business interest in water valuation as a subject has risen in recent years (likely as resources become scarcer).
- 2) Most of the assessed tools are intended for companies (83), cover all sectors (73), have a global scale (80), and are free (74).
- 3) There is a strong focus on biodiversity/ecosystem services tools with few of the produced tools being water-specific (24).
- 4) The tools that focus on water mostly cover just one dimension of water risk (primarily scarcity/drought).
- 5) Most of the tools have emerged out of the US (33) and the UK (25).
- 6) 40 of the assessed tools are calculators, while methodologies are the second most common form (32).
- 7) There is a stronger focus on economic value (30+) than on financial value (26), which likely reflects some of the bias towards natural capital value quantification in many of the assessed tools.

Business interest in water valuation as a subject has risen in recent years.



3 A new approach to water valuation – The Water And ValuE (WAVE) Tool

WWF has been involved in evaluating and quantifying the impacts of water risk for the past decade and has been tracking the development of various tools, including those mentioned in Section 2 of this report. Due to considerable confusion in the water valuation space, WWF and IFC collaborated in 2015 to outline a framework that could elaborate the relationship between water risk, water value, and water stewardship.

The hope was that one or more tools would emerge to fill the gaps left by the existing tools. However, given the ongoing limitations outlined in this report, WWF began developing its own tool in 2017. A year later, Water Foundry, financed by Goldcorp, agreed to work with WWF to co-develop the tool, and in 2019, CDP also agreed to provide data to help power the tool.

The Water And ValuE (WAVE) tool is designed to leverage the backbone of the Water Risk Filter and CDP Water Security database (see Text Box 1) as well as user inputs in order to convert water risk values into present and potential future financial impacts for a given site. Like some of the other tools noted earlier, it is mainly intended for corporate audiences and possibly some equity investors as it primarily focuses on cash flows and the site level. In that regard, it is most similar to the Water Risk Monetizer in its functionality, but it explores a broader array of risks and uses a different methodology.

Overview of the WAVE tool's beta version

WAVE begins by drawing upon data from the Water Risk Filter. Through an additional app, these data are then supplemented by higher resolution event probability values. Finally, user entered financial information and CDP Water Security data are employed to underpin a Monte Carlo simulation model, which runs repeatedly for a ten-year duration. The results are then split up amongst the financial impact categories noted in Figure 2, which are largely aligned with CDP. The full process is outlined and illustrated in Figure 3.

DIRECT: Operational and Maintenance Expenditures

- Increased operating costs –energy costs (from water)
- Increased operating costs – water procurement costs
- Increased operating costs – water treatment costs (if distinct from procurement)
- Increased operating costs – other water-dependent good costs (agricultural commodities, chemicals, etc.)
- Upfront costs to adopt/deploy new practices and processes

DIRECT: Capital Expenditures

- Increased capital costs (including need for new water infrastructure)
- Impaired assets (including asset repairs)
- Write-offs and early retirement of existing assets / closure of operation

INDIRECT: Administrative and Compliance Expenditures

- Other water-related permitting and compliance costs
- Water-related staffing costs
- Water-related fines and penalties
- Water-related litigation costs

INDIRECT: Financial and Shareholder costs

- Brand damage
- Water-related insurance costs and increased insurance premiums
- Increased financing costs (reduction in capital availability)

DIRECT: Revenue Impacts

- Site disruption leading to impact on production/output (including loss of license to operate)
- Delays in permitting (including loss of license to establish)
- Constraint to growth (including loss of license to grow)

Figure 2: Financial impact categories used in WAVE's beta version

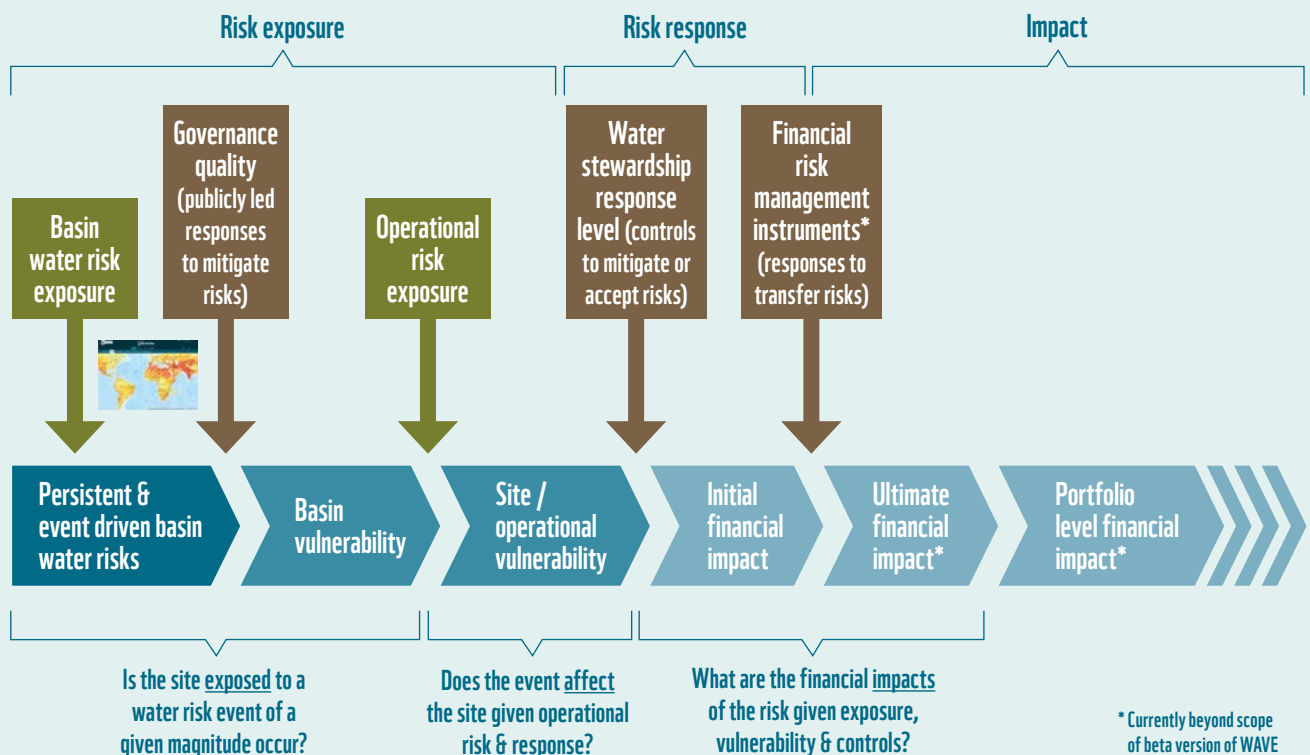


Figure 3: Process of translating water risk to financial impact in WAVE

The following aspects differentiate WAVE from existing tools:

- (A) WAVE has the ability to comprehensively handle an array of eight different basin risk drivers spread across physical, regulatory, and reputational water risk (vs. other tools which tend to focus on one or two physical water risk issues – e.g., scarcity/drought or quality);
- (B) WAVE is tied to a more comprehensive list of expenses and revenues that link to an income statement (vs. other tools which tend to focus on a limited set of costs – e.g., water procurement or treatment costs);

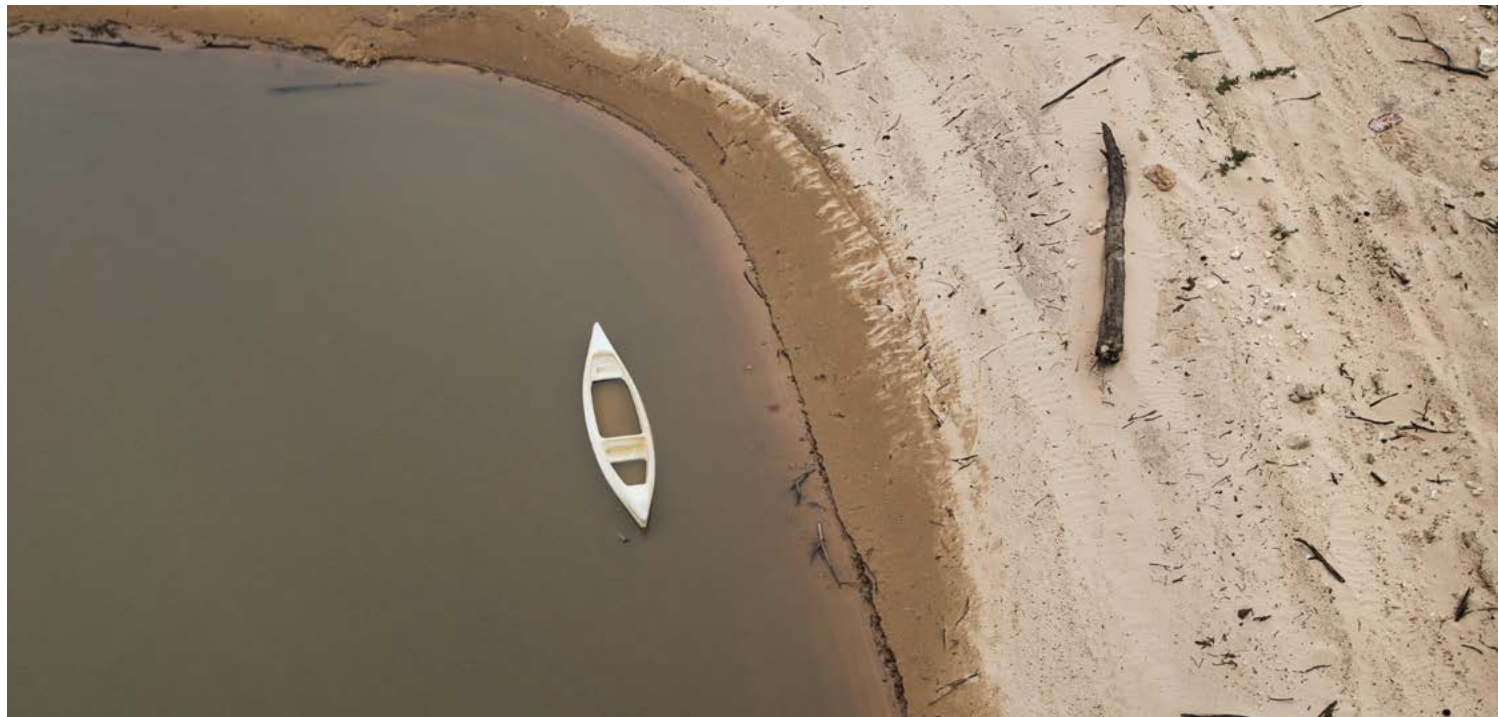
Box 1: WAVE – Powered by CDP

CDP is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. Over the past 15 years, CDP has created a system that has resulted in engagement on environmental issues worldwide. CDP's work on water security motivates companies to disclose and reduce their impacts on water resources by using the power of investors and customers. The data collected helps decision makers to reduce risk, capitalize on opportunities, and drive action towards a more sustainable world.

WAVE draws upon several years' worth of reported CDP Water data to help link water risk events to financial impacts.



- (C) WAVE is powered by CDP's Water Security database (Box 1), which draws upon thousands of real-world data points to link key water risk events to different types of financial impacts (vs. other tools which assume relationships);
- (D) WAVE harnesses water-related probability data along with water risk derived data to inform likelihoods (vs. most other tools which draw on risk categorized data – e.g., baseline water stress); and
- (E) WAVE does not rely upon shadow pricing, meaning it is sensitive to impacts even for non-water-intensive operations affected by water.



It is our belief that these aspects enable WAVE to more comprehensively account for the financial impacts caused by exposure to basin water risk events. Furthermore, the avoidance of shadow pricing as a method means that it is less susceptible to the biases that are driven by high or low water using facilities and to the assumptions around relationships between pricing and scarcity.

For those in the financial sector, WAVE offers a tool suitable for asset-level water risk evaluation, which can convert risk exposure into financial impacts suitable for financial analysis purposes. It is worth noting that WAVE is not (in its present form) suitable for portfolio level applications, including stock pricing, due to the ongoing lack of asset-level data, but would be suitable for lenders on large, single-site projects or private equity investments into singular site-based projects. Similarly, it could be used by investors considering whether to divest or acquire select assets during an acquisition.

The future goal is to enable WAVE to more explicitly handle scenarios, which will help with stress testing as recommended by the the Task Force on Climate-related Financial Disclosure (TCFD). The developers also believe that, given asset-level data and modifications to the tool to allow for batch processing, a portfolio-level water risk valuation approach could be developed for WAVE that would enable corporate, and not only site-level, valuation calculations.

While WAVE will not fit the needs for all users, as Table 1 outlines, we believe it fills a significant gap in the field of water valuation tools. With WAVE now in beta mode, we are calling on companies and investors to work with us to explore the tool and start putting a value on their water risks. This engagement will help to enhance the tool for the benefit of the entire financial sector.

	Water Risk Monetizer	Water Risk Valuation Tool	Corporate Bond Water Credit Risk Tool	Drought Stress Testing Tool	WAVE
Primary Audience	Corporations	Equity investors	Bond issuers	Banks	Corporations; Equity investors
Industries covered	Unlimited	Mining	Mining, energy, beverages	19 industries in four countries	All
Risk types covered	Physical (scarcity & quality)	Physical (scarcity)	Physical (scarcity)	Physical (drought)	Physical water risk (scarcity, drought, quality, flooding, water-borne diseases), Regulatory (tariffs, policy shifts), and Reputational risks (community conflict)
Asset classes covered	Investments	Investments	Corporate bonds	Loans	Investments or loans
Relevance of the financial ratios	Medium	High	High	High	High
Timeline	3, 5, and 10 years	Every year until 2021	2010, 2020, 2030, 2040	Every year for 5 years	Present to 10 years
Data required (for users)	Location; water use; water price; production data)	Production impacts; company action, shadow price	Financial data, location, water use	Financial data, location, production data)	Location; water use; water price; production and financial data
Data credible and up-to-date	Uses data from WWF and WRI As of: 2016	Uses data from WRI and Bloomberg As of: 2015	Uses data from WRI and Bloomberg As of: 2015	Uses data from RMS As of: 2017	Uses data from WWF and CDP As of: 2019
Adjustability	Yes	Yes	Yes	Yes	Yes
Scenario analysis	1 drought scenario	WRI-based scenarios	WRI-based scenarios	5 drought scenarios	Yes (manual); TCFD scenarios to come in future version
Approach output	Shadow price	Shadow price	Shadow price	Credit rating adjustment	Sum of value potentially affected by financial impact category
Costs	Free of charge	Bloomberg access required	Free of charge	Free of charge	Free of charge

Table 1: Overview of tools to measure water risks (from Part II of series), but including WAVE

5 Conclusions and recommendations

Water risk and water valuation are of growing interest to the financial sector as a whole, but represent a relatively new field.

While financial institutions are increasingly beginning to appreciate that they are indeed exposed to water-related risks, which in turn result in financial impacts, there is still a lack of resources to guide this market need.

As indicated in Parts I and II of this report series, valuation tools for water are still maturing, although there has been a rapid growth in the number of water risk valuation tools and approaches in recent years. Understanding the various forms of water value – along with other dimensions, such as target audience and methodology – is important to ensuring that users harness the best available tool. To this extent, the Valuing Water Database offers financial institutions and others a valuable new resource to help guide the selection of the optimal tool(s).

Furthermore, there remains a strong need to convert water risk scores into quantified financial impact values. While this process remains in its early days, tools – like the new WWF and Water Foundry WAVE tool – will continue to help build a much stronger appreciation of how water risks affect, or may affect, financial value. This in turn, will lay the foundation for water risks to be more explicitly incorporated into investment and lending decisions.





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WWF Deutschland

Reinhardtstraße 18

10117 Berlin | Germany

Tel.: +49 (0)30 311 777 700

Fax: +49 (0)30 311 777 888

www.wwf.de