

ENVIRONMENTAL METHODOLOGY 2

# Water Consumption

Topic Methodology



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# Table of Contents

<b>1</b>	<b>1 INTRODUCTION</b>	<b>10</b>
	1.1 Document purpose	11
	1.2 Topic description	11
	1.3 Key concepts and definitions	12
	1.4 Scope and assumptions	13
<b>2</b>	<b>2 IMPACT PATHWAY</b>	<b>15</b>
	2.1 Summary	16
	2.2 Description and notes	16
<b>3</b>	<b>3 IMPACT DRIVER MEASUREMENTS</b>	<b>18</b>
	3.1 Data requirements	19
	3.2 Data sources, gaps, and uncertainty	21
<b>4</b>	<b>4 OUTCOMES, IMPACTS, AND VALUATION</b>	<b>23</b>
	4.1 How to calculate impacts	24
	4.2 Outcomes and impacts	25
	4.3 Monetary valuation	26
<b>5</b>	<b>5 FUTURE DEVELOPMENT</b>	<b>29</b>
	<b>APPENDIX A: GLOSSARY</b>	<b>37</b>
	<b>APPENDIX B: METHODOLOGICAL DETAILS</b>	<b>44</b>
	<b>APPENDIX C: ACCESSING LOCAL WATER STRESS AND BIODIVERSITY PRESSURE</b>	<b>46</b>
	<b>APPENDIX D: NATIONAL VALUE FACTORS, WATER STRESS, AND BIODIVERSITY PRESSURE – GLOBAL PERSPECTIVE</b>	<b>49</b>
	<b>APPENDIX E: WATER CONSUMPTION VALUE FACTOR TOOL</b>	<b>63</b>
	<b>APPENDIX F: PREVIOUS YEAR VALUE FACTORS</b>	<b>65</b>
	<b>APPENDIX G: ALIGNMENT WITH REPORTING STANDARDS</b>	<b>67</b>
	<b>APPENDIX H: GOVERNANCE FOR VALUATION</b>	
	<b>TRANSPARENCY REQUIREMENT REPORT: VALUE FACTORS</b>	<b>70</b>
	<b>BIBLIOGRAPHY</b>	<b>76</b>

# Executive Summary

# Executive Summary

The Water Consumption Topic Methodology can be used by preparers of impact accounts to measure and value the impact of water consumption on people and the natural environment. This Topic Methodology can also be applied by users of impact information to manage the sustainability-related risks, opportunities, and impacts of an entity and inform decision-making regarding an entity's contribution to sustainability.

To use this Topic Methodology in its entirety, preparers should:

- develop a full accounting of water consumption including an entities' own operations as well as upstream and downstream in the value chain, considered separately;
- organize water consumption data by location, either locally or nationally, at the most precise geographical unit that data is available;
- utilize the impact pathway and value factors developed in this Topic Methodology to convert water consumption into impact accounts;
- present any related impact information with supplemental notes and qualitative commentary necessary to meet the qualitative characteristics of impact information.<sup>1</sup>

**Section 1** introduces the purpose of the document, outlines key concepts and definitions, and defines the scope for the Topic Methodology. This includes defining water consumption as the amount of water drawn into the boundaries of the entity and not discharged back to the water environment or a third-party water manager, in alignment with the European Sustainability Reporting Standards (ESRS) and the Global Reporting Initiative (GRI).

**Section 2** develops the impact pathway for water consumption, consisting of inputs, outputs, outcomes, and impacts. The primary input to an entity's activities is the water withdrawn from a water source, which results in water discharged as an output back to the environment, with water consumption serving as the difference in these two values.

This leads to outcomes related to changes in natural capital, resulting in impacts on human well-being. These impacts include:

- altered ecosystem services;
- financial costs of access to water;
- affected health from malnutrition; and
- affected health from waterborne diseases.

**Section 3** establishes the data required for the Topic Methodology including water consumption (m<sup>3</sup>) data of the entity and its value chain, organized by the location of water consumption at the most precise geographical unit available. Based on these locations, the local water stress and biodiversity pressure can be sourced to apply local value factors. The Topic Methodology has two options for application based on the precision of location data.

The data requirements are aligned with and expand upon disclosure requirements established by relevant standard setters including European Sustainability Reporting Standards (ESRS) E3: Water and marine resources and the Global Reporting Initiative (GRI)303: Water and effluents 2018.

**Section 4** outlines the approach of the Topic Methodology for measuring and valuing the impacts of water consumption, leading to value factors for altered ecosystem services, financial costs to access future water, affected health from malnutrition and health from water-borne diseases.

- Ecosystem Services: The relationship between ecosystem services and water availability is developed using The Ecosystem Services Valuation Database (ESVD);
- Financial Costs to Access Future Water: Models of water supply and demand are valued based on replacement costs;
- Affected health from malnutrition: Impacts are measured by the links between water consumption and water deprived from agriculture, the number of people malnourished within the region, and the disability-adjusted life years (DALYs) lost from malnutrition, then valued using a value of statistical life (VSL); and

<sup>1</sup>See General Methodology 1: Conceptual Framework for Impact Accounting.

## Executive Summary

- Affected health from water-borne diseases: Links between lost DALYs to domestic freshwater usage, house connection to water supply and sanitation, gross domestic product per capita, health care expenditure, and average annual temperatures are valued using the VSL.
- Each value factor can be determined nationally or sub-nationally. To determine the aggregated value factor, the largest value factor of ecosystem services, malnutrition and waterborne diseases (representing a near-term opportunity cost) is added to the value factor for access to future water.
- To determine the societal cost of water consumption, preparers then multiply the aggregated value factor by the entity-specific water consumption (m<sup>3</sup>) for each location.

**Section 5** articulates opportunities for further development of the Topic Methodology, including potential areas of improvements in data quality for water consumption, advancement in valuation approaches and frameworks to quantify potential positive impacts of an entity producing and discharging more water than it withdraws.

This Topic Methodology builds on frameworks and protocols published by leading organizations in the impact management ecosystem and sustainability-related disclosures required by governing jurisdictions and international standard setters, including:

- Capitals Coalition<sup>2</sup>;
- Ecosystem Service Valuation Database (ESVD)<sup>3</sup>;
- European Sustainability Reporting Standards (ESRS)<sup>4</sup>;
- Global Reporting Initiative (GRI)<sup>5</sup>;
- Intergovernmental Panel on Climate Change (IPCC)<sup>6</sup>;
- The Transparent Project<sup>7</sup>;
- World Resources Institute (WRI)<sup>8</sup>; and
- World Wide Fund for Nature (WWF).<sup>9</sup>

<sup>2</sup>Capitals Coalition. (2025a). Capitals Protocol – Part of the Integrated Decision-Making Framework; Capitals Coalition. (2025b). Governance for Valuation – Part of the Integrated Decision-Making Framework.

<sup>3</sup>ESVD. (2025). Ecosystems Services Valuation Database (ESVD).

<sup>4</sup>ESRS. (2022). E3: Water and marine resources.

<sup>5</sup>GRI. (2023). GRI 303: Water and effluents 2018.

<sup>6</sup>United Nations. (2024). U.N. Sustainable Development Goal 6: Ensure access to water and sanitation for all.

<sup>7</sup>Transparent (2023). Standardized Natural Capital Management Accounting. A methodology promoting the integration of nature in business decision making.

<sup>8</sup>World Resource Institute. (2023). Aqueduct 4.0 Water Risk Atlas Data Dictionary.

<sup>9</sup>World Wildlife Fund. (2023). WWF water risk filter: Methodology documentation.

# 1. Introduction

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## 1.1 DOCUMENT PURPOSE

1. The purpose of this document is to outline the Topic Methodology for Water Consumption (henceforth, Water Consumption Methodology) as part of the impact accounting methodology being developed by the International Foundation for Valuing Impacts and the Value Balancing Alliance.

2. The impact accounting methodology measures and values the impacts of corporate entities (entities or an entity) in monetary terms for the purposes of preparing impact accounts and generating impact information. The Water Consumption Methodology can be used to inform internal decision-making, investment decisions, and understand the significance of water consumption impacts of an entity.

3. Preparers of impact accounts should adhere to the entirety of the Methodology to the fullest extent possible and should disclose any deviations from it when shared with users of impact information.

## 1.2 TOPIC DESCRIPTION

4. For the purposes of the Water Consumption Methodology, water consumption is the volume of water drawn into the boundaries of the entity and not discharged back to the water environment or a third-party water manager.<sup>1</sup>

5. Water is a necessary human right and a requirement for life, exemplified by the United Nations enshrining “Access to water and sanitation for all” in the UN 17 Sustainable Development Goals.<sup>2</sup> Because of the necessity for numerous activities, nearly all entities are reliant on water at some stage in the value chain. The wide-spread negative impacts of water over-extraction on *stakeholders* has led to increased calls for improved water stewardship by the United Nations,<sup>3</sup> World Resources Institute,<sup>4</sup> CDP,<sup>5</sup> Science Based Targets Network,<sup>6</sup> Freshwater Hub,<sup>7</sup> Global Commission on the Economics of Water,<sup>8</sup> Alliance for Water Stewardship,<sup>9</sup> and sustainability reporting standards.<sup>10</sup>

6. While a global issue, the impacts of water consumption are often geographically specific, leading to disproportionate effects on some populations more than others. Many impacts occur because water consumption drives scarcity, depriving use by others. Local impacts are mediated by regional differences such as water stress, types of water use, municipal water infrastructure, sanitation practices, or land use. The seasonality of rainfall also drives greater impacts during the dry periods of the year when rainfall is low.

<sup>1</sup>ESRS. (2023). Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023; supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

<sup>2</sup>United Nations. (2024). U.N. Sustainable Development Goal 6: Ensure access to water and sanitation for all.

<sup>3</sup>United Nations. (2024). U.N. Sustainable Development Goal 6: Ensure access to water and sanitation for all.

<sup>4</sup>Lakshman, S. (2023). The Next Phase of Corporate Sustainability: Addressing Consumer Water Use.

<sup>5</sup>CDP. (2023). CDP water security 2023 reporting guidance.

<sup>6</sup>Science Based Targets Network. n.d.

<sup>7</sup>Science Based Targets Network. (2024). Corporate water stewardship and science-based targets for freshwater: Alignment and interoperability between leading approaches.

<sup>8</sup>Global Commission on the Economics of Water. (2023). Turning the Tide: A call to collective action by the Global Commission on the Economics of Water.

<sup>9</sup>Alliance for Water Stewardship. (2019). The AWS Standard 2.0 and Guidance.

<sup>10</sup>GRI. (2018). GRI 303: Water and effluents. and ESRS E3: Water and marine resources.

## 1. Introduction

7. The negative impacts on society continue to worsen as water consumption continues to increase. In the last century, water use has increased at nearly twice the rate of the human population.<sup>11</sup> Only 0.5% of water on Earth is usable freshwater which will continue to be a stressed, finite resource into the future.<sup>12</sup>

Approximately two billion people globally have limited access to safe drinking water, and roughly half of the global population experiences a duration of severe water stress every year.<sup>13</sup> Climate change is further exacerbating the impacts from water consumption in numerous ways, including through increased rainfall variability, toxic algal blooms and further reductions in access to clean water sources.<sup>14,15,16</sup>

8. The Water Consumption Methodology takes a societal perspective by considering the impacts on society within the region where water is consumed. By measuring and valuing the impacts on society, water consumption impact accounts can provide guidance to entities by considering local context, such as water stress, to manage and mitigate risks.

9. The Water Consumption Methodology, as presented, covers an entity's own operations as well as its upstream and downstream value chain. The extent to which all value chain levels should be included in impact accounts is dependent upon the relevance of the impacts at each value chain level from an impact materiality perspective.

10. While the Water Consumption Methodology measures the impacts of the entity on stakeholders, understanding and managing water consumption impacts may also help an entity manage production needs, operational costs, supply chain disruptions, resource allocation, and reduce the risk of costs

related to reputational damage and legal action.

### 1.3 KEY CONCEPTS AND DEFINITIONS

11. For the Water Consumption Methodology, important key terms are defined as follows:

- a) **Water consumption:** The amount of water drawn into the boundaries of the entity and not discharged back to the water environment or a third-party water manager over the course of the reporting period.<sup>17</sup>
- b) **Water withdrawal:** The sum of all water drawn into the boundaries of the entity from all sources for any use over the course of the reporting period.<sup>18</sup> These sources include (1) surface water, (2) groundwater, (3) seawater, and (4) produced water such as water harvesting<sup>19</sup> whether withdrawn directly from a source by the entity or provided to the entity through water suppliers. *Green water* is not considered as part of water withdrawal as this portion of precipitation eventually evaporates or transpires through vegetation.<sup>20</sup>
- c) **Water discharge:** The sum of effluents, used water, and unused water released to surface water, groundwater, seawater, or a third-party over the course of the reporting period.<sup>21</sup> To qualify as water discharge within the Water Consumption Methodology, water should be released in the same geographical location as water withdrawal.
- d) **Water stress:** The ability, or lack thereof, to meet the human and ecological demand for water.<sup>22</sup> Water risk<sup>23</sup>, more broadly, considers water stress as well as accessibility of water and regulatory or reputational issues.

<sup>11</sup>Food and Agriculture Organization of the United States. (2017). Water for sustainable food and agriculture: A report produced for the G20 Presidency of Germany.

<sup>12</sup>United Nations. (2024). Water – at the center of the climate crisis.

<sup>13</sup>United Nations. (2022). The sustainable development goals report 2022.

<sup>14</sup>World Wildlife Fund. (2023). High Cost of Cheap Water: The true value of water and freshwater ecosystems to people and planet.

<sup>15</sup>Intergovernmental Panel On Climate Change (ipcc). (2023). Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Chapter 4: Water.

<sup>16</sup>Ho, J. C., & Michalak, A. M. (2020). Exploring temperature and precipitation impacts on harmful algal blooms across continental U.S. lakes.

<sup>17</sup>ESRS. (2023). Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023; supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

<sup>18</sup>ESRS. (2023). Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023; supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

<sup>19</sup>See definition of each type of water in the Glossary.

<sup>20</sup>Green water refers to precipitation on land that does not run off or recharge groundwater but is stored in the soil or temporarily remains on the surface of the soil or vegetation. For further definition, see Appendix A.

<sup>21</sup>Definition adapted from GRI. (2023). GRI Standards Glossary. This also aligns with the definition in ESRS.

<sup>22</sup>As defined in GRI. (2018). GRI 303: Water and effluents.

<sup>23</sup>As defined in ESRS. (2022). E3: Water and marine resources.

## 1. Introduction

12. A complete set of defined terms is included in the Glossary.

### 1.4 SCOPE AND ASSUMPTIONS

13. Water consumption represents water that may have been used in production, incorporated into products, consumed by humans or animals, evaporated or transpired, stored by the entity, generated as waste, or contaminated beyond acceptable limits within the reporting period (Figure 1).<sup>24</sup>

14. The scope and boundaries of the Methodology include full value chain water consumption. This includes *upstream, direct operations,* and downstream as defined in General Methodology 1. An entities' own operations should be the same scope used for financial statements to ensure comparability. Value chain water consumption may be based on models and not directly measured due to the challenges of measuring upstream and downstream water consumption impacts.<sup>25</sup>

15. The Water Consumption Methodology recognizes full responsibility of an entity for its upstream and downstream water consumption. Water consumption is attributed to an entity through physical or economic relationships by partitioning the inputs or outputs of water consumption and determining the portion that is linked to the entity. The inclusion of value chain water consumption means that double counting will occur if aggregating across entities in the same value chain. However, this will not lead to double counting within an individual entity's impact statement.

16. The impacts captured in the Water Consumption Methodology are strictly related to water consumed, in cubic meters (m<sup>3</sup>). Impacts caused by the discharge of contaminated or altered water are included in the Water Pollution Methodology (currently, the Water Pollution Interim Methodology)<sup>26</sup> and do not fall within the scope of the Water Consumption Methodology.

17. Any actions taken to alter water recycled, stored, or lost will affect water consumption (Figure 1). For example, increasing the use of recycled water can decrease water withdrawal and reduce water consumption. For the purposes of the methodology, rainwater harvesting is equivalent to surface water usage and therefore does not reduce water consumption totals.

18. Since water consumption impacts are geographically specific, a high degree of precision in the source of water consumption is necessary for a proper valuation. To maximize the usefulness in decision-making, preferred water consumption data should be for the watershed or more precise. As an alternative, country data is also recognized in cases when this level of detail is not known.

19. In most circumstances, water is consumed by an entity, leading to negative impacts. The scope of this methodology only considers these negative impacts. However, there are possible scenarios where the production (as opposed to consumption) of water leads to positive impacts.

20. The Water Consumption Methodology provides guidance for its application under distinct valuation perspectives:<sup>27</sup>

- a) **Local Perspective:** This perspective expresses water consumption impacts using country-specific benchmarks and price levels. Water consumption impacts are measured in local terms, reflecting the economic conditions and purchasing power within each jurisdiction. It is suitable for assessments that prioritize local stakeholder relevance or require alignment with national standards and contexts.
- b) **Global Perspective:** This perspective adjusts all key variables based on purchase power parity (PPP) and anchors calculations to global benchmarks such as a globally representative *Value of a Statistical Life (VSL)*.<sup>28</sup> This allows for consistent valuation of impacts across countries, enabling comparability by removing distortions caused by income or price level differences.

<sup>24</sup>Examples from GRI. (2018). GRI 303: Water and effluents.

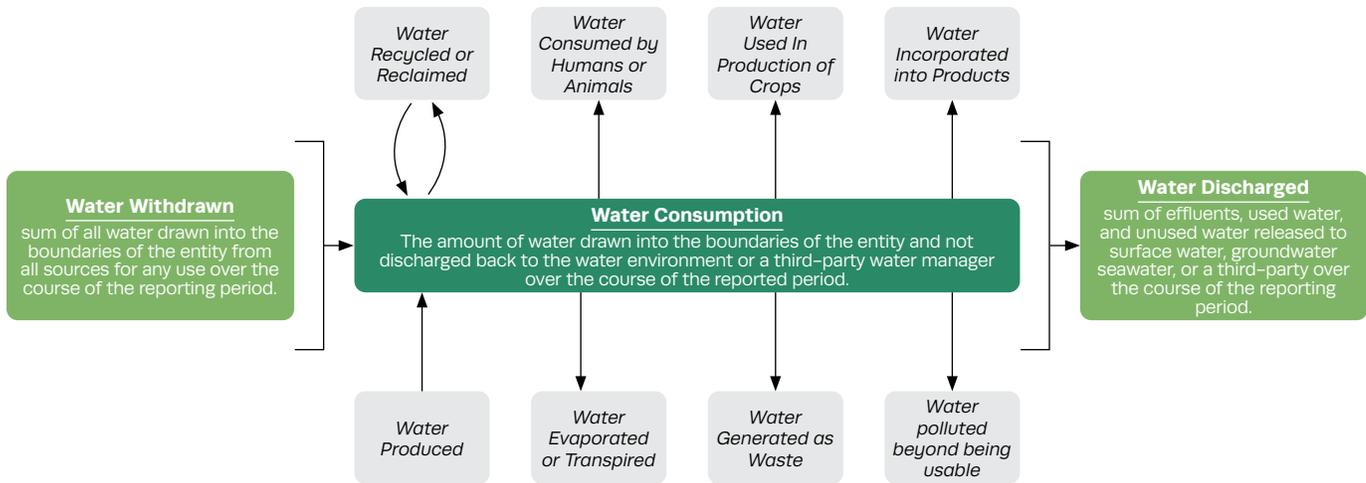
<sup>25</sup>See Section 3.2

<sup>26</sup>International Foundation for Valuing Impacts. (2024). Interim Methodologies: Water Pollution.

<sup>27</sup>For more information on local and global valuation perspectives, see chapter 7 of Appendix B. In some instances, complementary assessments might be conducted to reflect further utility weighing of the impacts, which sit outside of the official methodology. Chapter 7 of Appendix B provides further recommendations for such assessments.

<sup>28</sup>OECD (2025). Mortality Risk Valuation in Policy Assessment: A Global Meta-Analysis of Value of Statistical Life Studies

# 1. Introduction



$$\text{Water Withdrawn} - \text{Water Discharged} = \text{Water Consumption}$$

Figure 1. Schematic diagram of the linkages between various flows of water for an entity, including water consumption<sup>29</sup>

<sup>29</sup>Categories of water consumption come from GRI. (2018). GRI 303: Water and effluents. Within the Water Consumption Methodology, to qualify as water discharge, water must be released in the same geographical location as water withdrawal.

# 2. Impact Pathway

## 2. Impact Pathway

### 2.1 SUMMARY

21. The water consumption impact pathway is the series of consecutive, causal relationships, ultimately starting with water consumed by entities as the input for an entity's activities and linking changes in natural capital with related changes in people's well-being.

22. Detailed components of the impact pathway are outlined in subsequent sections, leading to the measurement and valuation of an entity's water consumption in *Section 4: Outcomes, Impacts, and Valuation*.

23. The impact pathway for water consumption is as follows:

### 2.2 DESCRIPTION AND NOTES

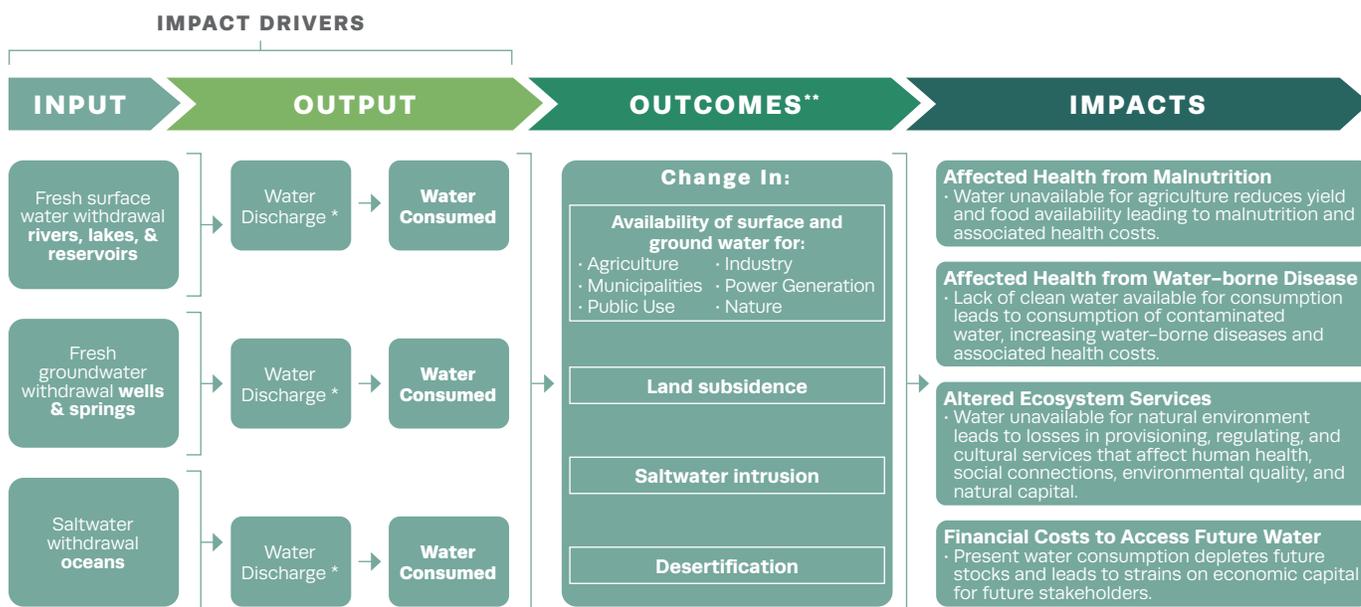
24. The primary input for the water consumption impact pathway is the water withdrawn<sup>30</sup> from a water source into the boundaries of the entity. Water can be withdrawn from surface water (rivers, lakes, and reservoirs), groundwater (wells or springs), or seawater

(oceans). Water withdrawal is considered whether it is withdrawn directly by the entity or provided to the entity through municipal water suppliers.

25. Outputs from the entity include water discharged back to the water environment and the subsequent determination of water consumption. The water discharged occurs when water leaves the boundaries of the entity and released back to surface water, groundwater, seawater, or a third-party water manager.

a) The primary unit of output used to calculate impacts is water consumption. Water consumption is water that is withdrawn from a water source and not discharged back to the water source over the course of the reporting period.<sup>31,32</sup> Any produced water would be captured in water consumption by increasing the water discharge.

26. The outcomes of water consumption are changes in natural capital.<sup>33</sup> Nature has a systemic relevance for society and thus drive subsequent impacts.<sup>34</sup> Available surface water and groundwater are depleted leading to lost opportunities for others to access this water.



\*Impacts from pollution of discharged water is outside the scope of this methodology.

\*\*Changes in outcomes are partially represented implicitly through the measurement and valuation of impacts.

Figure 2. Water consumption impact pathway

<sup>30</sup>Sometimes termed "water use". Reig, P. (2013). What's the Difference Between Water Use and Water Consumption?

<sup>31</sup>Reig, P. (2013). What's the Difference Between Water Use and Water Consumption?

<sup>32</sup>ESRS. (2023). Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023; supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

<sup>33</sup>Natural Capital changes are measured in physical and biological terms and are not expressed in monetary terms. Monetary valuation is applied at the impact level.

<sup>34</sup>See NGFS. (2023). The Green Scorpion: the Macro-Criticality of Nature for Finance which expands on this systemic relevance.

## 2. Impact Pathway

These include lost opportunities for use by agriculture, municipalities, the public, industry, power, and nature. Environmental quality changes when water extraction leads to land subsidence, desertification, and saltwater intrusion damages in coastal communities.

27. The impacts applied in the Water Consumption Methodology fall into four categories of changes in:

- a) *Affected health from malnutrition.* The lost opportunity to use water for agriculture can lead to lower food production. Reduced food production increases malnutrition rates, particularly in locations with limited connections to alternative food sources, impacting human health.
- b) *Affected health from water-borne disease.* Similarly, when water is not available for human consumption, this can force people to use alternative water sources that may have lower quality and increased contaminants. The consumption of this water can lead to increases in water-borne disease rates, impacting human health.
- c) *Altered ecosystem services.* Water consumption also deprives the natural environment of water, leading to reduced ecosystem quality. Reduced quality of nature driven by water deprivation then minimizes its ability to sustain human life by providing ecosystem services for human well-being. The extent to which ecosystem service impacts are affected by water consumption is mediated by stability and resilience of an ecosystem with biodiversity serving as the key metric. Therefore, in areas where biodiversity is already under pressure<sup>35</sup> from other factors such as

invasive species or land clearing, the loss of water will lead to greater impacts of water consumption on ecosystem service provisioning. The impacts may come through altered *provisioning, regulating, and cultural services*.<sup>36</sup>

- d) *Financial costs to access future water.* The present consumption of water at a greater rate than it is replenished, regardless of whether the source is surface water or groundwater,<sup>37</sup> leads to long-term impacts on *water access* for future generations. Increased scarcity of water in the future will lead to significant strains on economic capital as a variety of stakeholders seek alternative strategies to obtain clean water. This cost will lead to added financial burdens long into the future that occurred because of present day unsustainable water consumption. This may come through paying for bottled water, new infrastructure to access water (desalinization or deeper wells), travelling further distances to access water, or paying increased water fees to water providers.

28. While several other impacts are known, present research is not yet sufficiently developed to capture these impacts of water consumption. These include damages to infrastructure and agriculture from land subsidence, loss of livable land area for society from desertification and saltwater intrusion, algal blooms from sedimentation affecting health, emigration from water-stressed regions, and the added systemic dimensions of nature for the financial system.<sup>38</sup> New research will continue to develop techniques to capture additional impacts.

<sup>35</sup>The pressure on biodiversity as a mediator of ecosystem services is further expanded upon in Section 3.1 Data Requirements.

<sup>36</sup>See definitions and examples of each category of service in the Glossary.

<sup>37</sup>Surface water (e.g., lakes, rivers, and streams) and sub-surface water (e.g., groundwater) are deeply interconnected. Surface water can recharge aquifers, while groundwater can discharge into rivers, lakes and streams. As a result, surface and sub-surface water sources are interdependent, and extraction from one can dramatically affect the other. U.S. Geological Survey. (2019). Groundwater/Surface-Water Interaction.

<sup>38</sup>NGFS. (2023). The Green Scorpion: The Macro-Criticality of Nature for Finance.

# 3. Impact Driver Measurements

### 3. Impact Driver Measurements

29. *Impact drivers* consider inputs and outputs and reflect the data needs expected of a preparer to provide an impact account for water consumption. The section below outlines the specific data needed along with how preparers should consider data gaps and uncertainty.

#### 3.1 DATA REQUIREMENTS

30. To utilize the Water Consumption Methodology, the following data are needed (see Table 1):

- a) An entity's total water consumption is required, including own operations as well as upstream and downstream in the value chain, considered separately. All water consumption data should be in units of m<sup>3</sup>.
  - Water consumption considers both water withdrawn from a water source and water discharged back to the water environment.<sup>39</sup> Section 3.3 provides additional guidance for determining water consumption including guidance on filling data gaps with estimation.
  - Water consumption data needs to be organized by the location of water consumption at the most precise geographical unit that data is available.
- b) The local water stress ( $WS_{local}$ ) and the country water stress ( $WS_{national}$ ) are required for each location of water consumption, as determined by the Aqueduct Water Risk Atlas.<sup>40</sup>
  - This resource uses the PCR-GLOBWB 2 model<sup>41</sup> to determine the ratio of total water demand to available renewable surface and groundwater for sub-watersheds. This model runs at monthly intervals and considers multiple sources of water demand to determine water stress in each sub-watershed. The data in Aqueduct can be determined for each watershed, administrative

unit (e.g. state or province), or country.

- Guidance on how to obtain local or national water stress via the Aqueduct Water Risk Atlas<sup>42</sup> is provided in Appendix C. National water stress data are also reported in Table D1.
- c) The local pressure on biodiversity ( $BD_{local}$ ) and the country pressure on biodiversity ( $BD_{national}$ ) are required for each location where water consumption occurs, as determined by the WWF Biodiversity Risk Filter.<sup>43</sup>
    - Biodiversity is a trait of nature that serves to mediate the supply of ecosystem services and therefore serves as a useful metric to consider local impacts within the Methodology.<sup>44</sup> Biodiversity and ecosystem processes<sup>45</sup> are known to have a direct impact on ecosystem stability, productivity, resilience to environmental and anthropogenic stressors, and susceptibility to invasion.<sup>46</sup>
    - The Pressures on Biodiversity was selected because it takes a comprehensive approach to assessing local risks to biodiversity. This metric considers the risks and pressures on biodiversity by location and industry including effects on (1) land, freshwater, and sea use change, (2) forest canopy loss, (3) invasive species, and (4) pollution.<sup>47</sup> Taken together, the Pressure on Biodiversity metric presents a comprehensive understanding of the risk of biodiversity loss in a location, therefore serving as a good mediator for how water deprivation will drive loss in ecosystem service value.
    - Guidance on how to obtain local and national pressure on biodiversity via the WWF Biodiversity Risk Filter<sup>48</sup> is provided in Appendix C. The national biodiversity pressure data are also reported in Table D1.

<sup>39</sup>See definition in Section 1.3

<sup>40</sup>The Aqueduct Water Risk Atlas is referenced as a tool to assess water stress in ESRS. (2023). E3: Water and marine resources and GRI. (2018). GRI 303: Water and effluents.

<sup>41</sup>Sutanudjaja, E. H. et al. (2018). PCR-GLOBWB 2: a 5 arcmin global hydrological and water resources model.

<sup>42</sup>For further detail on how to obtain local water scarcity and biodiversity values, see Appendix C.

<sup>43</sup>World Wildlife Fund. (2023). WWF risk filter: Methodology documentation. The WWF Risk Filter Suite is referenced in both ESRS. (2023). E3: Water and marine resources and GRI. (2018). GRI 303: Water and effluents.

<sup>44</sup>IPBES. (2019). Global assessment report on biodiversity and ecosystem services.

<sup>45</sup>IPBES. (2017). Models of drivers of biodiversity and ecosystem change.

<sup>46</sup>Tilman, D. (1999). The Ecological Consequences of Changes in Biodiversity: A Search for General Principles.

<sup>47</sup>IPBES. (2017). Models of drivers of biodiversity and ecosystem change.

<sup>48</sup>National Biodiversity Risk Filter parameters, aggregated to national and sub-national levels, can be found via: <https://riskfilter.org/biodiversity/explore/country-profiles>

### 3. Impact Driver Measurements

Data input	Preferred: Minimum:	Location 1 (Country 1)	Location 2 (Country 2)	Location 3 (Country 3)
<b>Data from the entity</b>				
<i>Water Consumption</i>	· own operations			
	· upstream value chain			
	· downstream value chain			
<i>Location of water consumption</i>	· Preferred option – local			
	· Minimum option – country			
<b>Data from other sources</b>				
<i>Water Stress</i>	· Local (Preferred option only)			
	· National			
<i>Biodiversity Pressure</i>	· Local (Preferred Option Only)			
	· National			

Table 1. Data required from the entity and from other sources, disaggregated by location of water consumption

31. To provide sufficient detail for impact accounts, water consumption should be collected and presented separately for (1) own operations, (2) upstream value chain, and (3) downstream value chain in each watershed where water consumption occurs as in Table 1.

32. All data should be organized by location at the most precise geographical unit that data is available. Since water consumption impacts occur locally, the precise location of water consumption improves the decision-usefulness of information about water consumption impacts. Specific location data will also lead to the most representative and accurate impact accounting. There are two options, based on data availability:

a) *Preferred Option:* This option is used when entities have water consumption data that is tied to a specific location. This is likely the case when water

consumption is known from public utility data or from sourcing by the entity on the site (e.g., wells). In this option, an entity's water consumption data is organized by watershed and geographically specific water stress and pressure on biodiversity data is obtained from those same locations. Alternatively, data could be pulled at the smallest administrative region (e.g. *administrative level 1*, state, province, or district). The purpose of this option is to apply the Methodology at the most precise geographical unit. This is the preferred option for use of the Methodology as it will lead to the most accurate determination of the impact of an entities water consumption and is particularly relevant when applied to large countries that may have significant variability in conditions affecting impact.

### 3. Impact Driver Measurements

b) *Minimum Option*: When an entity does not have knowledge of water consumption in a subnational geographic unit, the Methodology can be applied for each country of water consumption. In this case, water consumption data would be organized for each country with only national value factors used. If an entity has water consumption data at a higher level of detail than the country, the minimum option should not be used. Where preparers use the minimum option, they should disclose their reasons for doing so.<sup>49</sup>

33. Supplemental notes or qualitative commentary should be included in water consumption impact accounts as noted in General Methodology 1. For water consumption this should clearly state which options (Preferred or Minimum) were used including justification for doing so. Additional commentary may include but is not limited to calculation methodologies, approaches to handling data gaps, key assumptions, alignment with planetary boundaries or science-based thresholds for sustainable consumption, and progress towards water consumption targets (Science Based Targets for Water).<sup>50</sup>

34. The data requirements of the Water Consumption Methodology are aligned with and expand upon disclosure requirements established by relevant standard setters including European Sustainability

Reporting Standards E3: Water and marine resources and the Global Reporting Initiative 303: Water and effluents 2018. Additional alignment may exist with other regional or topic specific reporting standards as well. Further details are presented in Table 2 and Appendix G.

#### 3.2 DATA SOURCES, GAPS, AND UNCERTAINTY

35. Preparers should strive to measure water consumption in a manner that is complete, neutral, and free from error. This includes faithfully representing the water consumption from all parts of the value chain.

36. In practice, obtaining full value chain water consumption data may be challenging for entities, particularly from upstream or downstream in the value chain. Barriers such as cost, accounting methods, or availability of data may require the use of secondary data to measure water consumption impacts in their entirety.

37. To determine water consumption, knowledge of water withdrawal and water discharge are both needed. If withdrawal is from a municipal water utility, then utility bills should provide detailed data on water withdrawal. If water is withdrawn by the entity itself (e.g., wells), then direct measure or estimation from

Metric	ESRS	GRI
Water Consumption – own operations	Fully aligned E3–4, p. 27(a)	Fully aligned 303–5(a)
Water Consumption – value chain	Expands upon p. 2, 3, 7(a), 11(c)*	Expands upon 303–1*
Location of water consumption	Expands upon E3–4, p. 27(b)	Expands upon 303–5 (b)
Water Stress	Expands upon E3–4, p. 27(b)	Expands upon 303–5 (b)
Biodiversity Pressure	Expands upon E4–5	Expands upon 304–2

\*When deemed material, value chain water consumption is required for both ESRS and GRI.

Table 2. Alignment with reporting standards<sup>51</sup>

<sup>49</sup>For some preparers, even country level data may not be available. Applications that apply global aggregations of value factors (e.g., based on water stress level reporting) are out of scope of the current Water Consumption Methodology. Additional guidance on how the methodology may be applied in such circumstances may be developed in future implementation guides. General, in such cases, it is recommended to apply assumptions that avoid underestimating water consumption impacts.

<sup>50</sup>Science Based Targets Network. (2024). Corporate water stewardship and science-based targets for freshwater: Alignment and interoperability between leading approaches.

<sup>51</sup>Categories of alignment include (1) fully aligned: data from reporting can be used as is for preparation of impact accounts; (2) expands upon: data from reporting conceptually aligns with the impact accounting methodology, but additional detail, context, or presentation is necessary for an accurate accounting of impact; or (3) independent: Data needed for the preparation of impact accounts are not covered by the reporting standards and would require separate data collection and analysis. Alignment with ESRS standards is based on EU Commission delegated act of 2023. For information on alignment with ESRS consultation draft released by EFRAG in July 2025, please refer to the VBA's Mapping tool for ESRS datapoints.

### 3. Impact Driver Measurements

activity data is needed. Water discharge data is often more difficult to obtain as water utilities often do not monitor it. If an entity is not directly measuring discharge, it can be assumed that no water discharge has occurred or estimated from secondary data.

38. Preparers should prioritize approaches that:<sup>52</sup>

- a) directly measure water consumption over those that estimate water consumption based on calculations from activity data,
- b) utilize primary data from specific activities within a company value chain over secondary data, and
- c) consider sources of data that are of the highest quality possible.

39. High quality data sources should consider:<sup>53</sup>

- a) technological representativeness. Does the data match the technology used?
- b) temporal representativeness. Does the data represent the actual time or age of the activity?
- c) geographical representativeness. Does the data reflect geographic considerations of the activity?
- d) completeness. Is the data statistically representative of the activity?
- e) reliability. Are the data sets or sources dependable?

40. Various estimation techniques can be used to determine water consumption. While a variety of techniques exist, those recommended for water consumption analysis include life cycle analysis (LCA) and *environmentally extended input-output (EEIO)* tables. Both approaches have developed frameworks for determining water consumption but may differ in levels of data specificity or considerations depending on the context of application.

41. Other resources may provide guidance for developing water consumption data including ISO 14046: 2014 Environmental Management Water Footprint,<sup>54</sup> CEO Water Mandate Corporate Water Disclosure Guidelines,<sup>55</sup> or CDP Water Security 2023 Reporting Guidance.<sup>56</sup> Additional guidance for developing water consumption data may also come from ESRS E3: Water and marine resources and GRI 303: Water and effluents 2018.

42. Uncertainty will arise when quantifying water consumption. Preparers should report qualitative uncertainty and, when possible, quantitative uncertainty. These may include but are not limited to propagated measured uncertainty, pedigree matrices, sensitivity analyses, or probability distributions.

<sup>52</sup>Language adapted to water consumption from the Greenhouse Gas Protocol. (2011). Corporate value chain (scope 3) accounting and reporting standard.

<sup>53</sup>Language adapted to water consumption from the Greenhouse Gas Protocol. (2011). Corporate value chain (scope 3) accounting and reporting standard.

<sup>54</sup>ISO 14046. (2020). Environmental management Water footprint: Principles, requirements and guidelines.

<sup>55</sup>The Global Compact. (2014). The CEO Water Mandate: Corporate water disclosure guidelines, Toward a common approach to reporting water issues.

<sup>56</sup>CDP. (2023). CDP water security 2023 reporting guidance.

# 4. Outcomes, Impacts, and Valuation

## 4. Outcomes, Impacts, and Valuation

43. The consequences of an entity's water consumption affect natural capital, which in turn influences human well-being through impacts on environmental quality, health and social connections.

44. The impact pathway in this statement has been developed using a value factor that collapses the impact measurement and valuation stages into a summary value that is location-specific for each category of impact. The value factors can then be multiplied directly by entity-specific water consumption using the equations in section 4.1. The measurement and valuation approaches are expanded upon in sections 4.2, 4.3 and Appendix B. To aid preparers in the calculation of their impact accounts, a Water Consumption Methodology Tool has been developed. See Appendix E for more details.

### 4.1 HOW TO CALCULATE IMPACTS

45. To determine the monetary cost of water consumption (H2O ValueTotal) using the preferred method, preparers should use the following equations:

$$H2O \text{ Value}_{\text{Total}} = \sum (WC_{\text{site}} * VF_{H_2O\text{-site}}) \text{ for all locations (Eq. 1)}$$

$$VF_{H_2O\text{-site}} = VF_{\text{access-site}} + \text{MAX}(VF_{\text{es-site}}, VF_{\text{nutrition-site}}, VF_{\text{disease-site}}) \quad (\text{Eq. 2})$$

$$VF_{\text{es-site}} = VF_{\text{es}} * \frac{BD_{\text{local}}}{BD_{\text{national}}} \quad (\text{Eq. 3})$$

$$VF_{\text{nutrition-site}} = VF_{\text{nutrition}} * \frac{WS_{\text{local}}}{WS_{\text{national}}} \quad (\text{Eq. 4})$$

$$VF_{\text{disease-site}} = VF_{\text{disease}} * \frac{WS_{\text{local}}}{WS_{\text{national}}} \quad (\text{Eq. 5})$$

46. Applying the preferred method to entity specific water data can be aided through the Water Consumption Value Factor Tool presented in Appendix E.

47 The variables in the equations are as follows:

$WC_{\text{site}}$	Water consumption ( $WC_{\text{site}}$ ) represents the total volume, in $m^3$ , of water consumed at each site of use. Water consumption is determined by an entity and described in Section 3.1.
$VF_{\text{access-site}}$	The value factor for the financial costs to access future water at each site of water consumption. For the preferred method, this value factor should be at administrative level 1 and be obtained from the Water Consumption Local Value Factor Tool in Appendix E.
$VF_{\text{es}}$	National value factor for altered ecosystem services. The country value factor used should correspond to the country of water consumption and can be accessed in Appendix D, Table D1.
$VF_{\text{nutrition}}$	National value factor for affected health from malnutrition. The country value factor used should correspond to the country of water consumption and can be accessed in Appendix D, Table D1.
$VF_{\text{disease}}$	National value factor for affected health from water-borne disease. The country value factor used should correspond to the country of water consumption and can be accessed in Appendix D, Table D1.
$BD_{\text{local}}$	Local biodiversity pressure. This value, combined with the national biodiversity pressure, is used to convert national value factors to local value factors using equation 3. This value can be accessed by obtaining the "Pressures on Biodiversity" value via the WWF Biodiversity Risk Atlas. <sup>57,58</sup>
$BD_{\text{national}}$	National biodiversity pressure. This value, combined with the local biodiversity pressure, is used to convert national value factors to local value factors using equation 3. National biodiversity pressure is also provided in Table D1.
$WS_{\text{local}}$	Local water stress. This value, combined with the national water stress, is used to convert national value factors for malnutrition and water-borne disease to a local value factor using equations 4 and 5. This value can be accessed by obtaining the local "Water Stress" value via the Aqueduct Water Risk Atlas.
$WS_{\text{national}}$	National water stress. This value, combined with the local water stress, is used to convert national value factors for malnutrition and water-borne disease to a local value factor using equations 4 and 5. This value can be accessed by obtaining the national "Water Stress" value via the Aqueduct Water Risk Atlas. National water stress values are also provided in Table D1.

<sup>57</sup>World Wildlife Fund. (2023). WWF water risk filter: Methodology documentation.

<sup>58</sup>See further description on how to access biodiversity and water scarcity values in Appendix C.

<sup>59</sup>See further description on how to access biodiversity and water scarcity values in Appendix C.

## 4. Outcomes, Impacts, and Valuation

48. The water consumption impact ( $H_2O$  Value<sub>Total</sub>) calculation is described below.

- a) Determining site-specific value factors:
- Eq. 3: The national value factor for ecosystem services is multiplied by the ratio of local ( $BD_{local}$ ) to national ( $BD_{national}$ ) biodiversity pressure. This ratio serves to translate the national value factor provided to the specific location of water consumption.
  - Eq. 4 and 5: The value factors for malnutrition and water-borne disease are each multiplied by the ratio of local ( $WS_{local}$ ) to national ( $WS_{national}$ ) water stress. This ratio serves to translate the national value factor provided to the specific location of water consumption.
- b) Aggregating to a single, site-specific value factor:
- Eq. 2: All value factors are converted into a total water consumption impact for each site ( $VF_{H_2O-site}$ ). The value factors for affected health from malnutrition ( $VF_{nutrition}$ ), affected health from water-borne disease ( $VF_{disease}$ ), and affected well-being from ecosystem services ( $VF_{es}$ ) each represent a near-term lost opportunity cost. The impact of each single unit of water could not have been used for all three alternative uses, therefore adding the three would overstate the impact. In this case, the largest value factor of the three is taken as this is the missed opportunity to maximize the value of that water for another use.<sup>60</sup>
  - The impact of financial costs to access future water is added to the highest value factor from the three near-term impacts. This value factor was developed by assessing the long-term impacts of habitual unsustainable extraction of present-day water in a given region. The  $VF_{access}$  is capturing impacts not represented by the other three value factors. In particular, it is assessing changes to long-term stocks of water which may not always present near-term impacts but will lead to long-term deprivation to future users. Therefore, near-term impacts from the other VFs can

occur while simultaneously having long-term impacts represented by  $VF_{access}$ .

- c) Equations 2–5 should be calculated separately for each location to obtain each site-specific impact. This is because the value factors, water stress values, and biodiversity values vary geographically. After applying equation 2 for each location, the total water consumption impact is determined by multiplying the water consumption by the impact of that site using equation 1. These are then summed to determine a total impact of water consumption.
- d) If an entity does not have knowledge of the location of water consumption, the minimum option applies the Water Consumption Methodology at a national level for each country. In this case, equations 3, 4, and 5 would not be used and the country value factors for  $VF_{access}$ ,  $VF_{es}$ ,  $VF_{nutrition}$ , and  $VF_{disease}$  would replace site-specific value factors. Equation 1 would be organized and calculated by country instead of by site. Country value factors are in Appendix D.

49. Entities shall define and consistently apply a local or global valuation perspective to create their water consumption impact accounts.<sup>61</sup> Guidance on applying this choice provided in Appendix B, Section 7.

50. Upstream value chain, downstream value chain, and own operations of water consumption should always be considered separately to increase transparency, comparability, and decision-usefulness. Additional levels of detail may be useful such as an assessment of water consumption regionally, nationally, or within specific value chain categories.

51. Because the consumption of water causes negative impacts to stakeholders as indicated in the impact pathway, the  $H_2O$  Value<sub>Total</sub> is negative.

### 4.2 OUTCOMES AND IMPACTS

52. The approaches used to link water consumption to each impact are described below. Additional methodological details are in Appendix B.

- a) Affected Health via Malnutrition ( $VF_{nutrition}$ ): The  $VF_{nutrition}$  utilizes the approach of LC-Impact to link water consumption to the loss of human health that comes from reduced agricultural production.<sup>62</sup>

<sup>60</sup>The largest near-term value factor is included as a base assumption in the topic methodology in order to avoid the risk of underrepresenting water consumption impacts. Water, if not consumed by the entity, may not in actuality be used by the 'highest impact' alternative. As such, it may be appropriate to analyze the likely usage as a complementary analysis to the methodology in unique circumstances where alternative water usage is known.

<sup>61</sup>For more information on local and global valuation perspectives, see chapter 7 of Appendix B. In some instances, complementary assessments might be conducted to reflect further utility weighing of the impacts, which site outside of the official methodology. Chapter 7 of Appendix B provides further recommendations for such assessments.

<sup>62</sup>LC-Impact. n.d. LC-Impact: A spatially differentiated life cycle impact assessment method.; Pfister, S. et al. (2021). 12. Water Stress.

## 4. Outcomes, Impacts, and Valuation

This occurs by a series of regressions that connect water consumption, water deprived from agriculture, the number of people malnourished within the region, and the disability-adjusted life years (DALYs) lost from malnutrition. The DALYs lost serve as the objective indicator of well-being.

- b) **Affected Health via Water-borne Disease ( $VF_{\text{disease}}$ ):** The  $VF_{\text{disease}}$  measures damage to human health by water-borne diseases known to be caused by limited domestic water availability (i.e., ascariasis, trichuriasis, hookworm disease, and diarrhea).<sup>63</sup> A multiple regression analysis links water consumption to DALYs using the following predictors: domestic freshwater usage, house connection to water supply and sanitation, gross domestic product per capita, health care expenditure, and average annual temperatures.<sup>64</sup> The DALYs lost serve as the objective indicator of well-being.
- c) **Altered Ecosystem Services ( $VF_{\text{es}}$ ):** The  $VF_{\text{es}}$  measures impacts that come through the lost ecosystem services. This is done by using the Ecosystem Services Valuation Database (ESVD),<sup>65</sup> a meta-analysis of 12,390 ecosystem service estimates across 6 continents. The studies in this analysis use numerous objective and subjective well-being indicators and methods to determine impacts across 23 individual ecosystem services that fall into three broad categories – provisioning services, regulating services, and cultural services.<sup>66</sup> Some ecosystem service impacts are already captured by other impacts in the impact pathway. Specifically, the provisioning service of food production is captured in the malnutrition impact. This ecosystem service is excluded in this pathway to avoid double-counting. The impacts from the ESVD are linked to water consumption using a global database of annual *actual evapotranspiration* (AET),<sup>67</sup> and an analysis of global land extents of biomes.<sup>68</sup> The impacts

from the ESVD are converted to water impacts using the AET value which estimates ecosystem water needs and, therefore, how the deprivation of water leads to lost ecosystem services. The final step converts the ecosystem service value per  $\text{m}^3$  to country ecosystem service impacts by doing a weighted average, considering the proportion of each biome type within the country.

- d) **Financial Costs to Access Future Water ( $VF_{\text{access}}$ ):** The  $VF_{\text{access}}$  represents the impacts of finding alternative sources of water for future users resulting from present-day water consumption. These impacts can persist for many years in several contexts. For each watershed, the model determines when water demand is greater than available renewable surface and groundwater supplies using the World Resources Institute's Aqueduct Water Risk Atlas.<sup>69,70,71</sup> The output from the model is a ratio of water demand over water supply with values above 1 representing unsustainable rates of extraction. This is repeated for every year and watershed to the year 2080. Results are then aggregated to a country (administrative 0) and sub-country (administrative 1) level.<sup>72</sup> This year represents a likely, yet conservative estimate of the length of impacts and the length of the model predictions from the Aqueduct Water Risk Atlas. This ratio is then used to determine the proportion of each unit of water that was extracted unsustainably, calculated as the percent of total water demand that is in excess of supply. The objective well-being indicator assesses the percent of total water demand in excess of supply for each watershed and year.

### 4.3 MONETARY VALUATION

53. Monetary valuation uses value factors to estimate the relative importance, worth, or usefulness of changes in capitals to people in monetary terms. The monetary valuation approach and value factors

<sup>63</sup>Motoshita, M. et al. (2011). Development of impact factors on damage to health by infectious diseases caused by domestic water scarcity.

<sup>64</sup>Motoshita, M. et al. (2011). Development of impact factors on damage to health by infectious diseases caused by domestic water scarcity.

<sup>65</sup>Brander, L. M. et al. (2024). Economic values for ecosystem services: A global synthesis and way forward.

<sup>66</sup>For definitions of these categories, see the Glossary.

<sup>67</sup>FEWS NET; USGS Data Portal. (2024). Annual Actual Evapotranspiration (ET).

<sup>68</sup>Song, X.-P. (2018). Global Estimates of Ecosystem Service Value and Change: Taking Into Account Uncertainties in Satellite-based Land Cover Data.

<sup>69</sup>Kuzma, S. et al. (2023). Aqueduct 4.0: Updated decision-relevant global water risk indicators.

<sup>70</sup>World Resource Institute. (2023). Aqueduct 4.0 Water Risk Atlas Data Dictionary.

<sup>71</sup>The Water Consumption Methodology utilizes the baseline and future datasets from Aqueduct's baseline water stress metric, defined as the ratio of total water demand to available renewable surface and groundwater supplies.

<sup>72</sup>For detailed information on dataset extraction, cleaning, calculation and aggregation, please refer to section 5 of Appendix B.

## 4. Outcomes, Impacts, and Valuation

are developed individually for each impact in the Water Consumption Methodology. Each approach is described briefly below with additional methodological details in Appendix B.

- a) Affected Health via Malnutrition ( $VF_{\text{nutrition}}$ ) and Water-borne Disease ( $VF_{\text{disease}}$ ): The DALYs lost for both value factors are valued using the value of statistical life (VSL). The VSL applied uses a single globally representative valuation of \$2,895,021 USD(2024), based on a VSL of \$2.7 million USD(2022)<sup>73</sup> from the OECD, adjusted for inflation.<sup>74</sup> The VSL is converted to the valuation of one year of life lost (YLL) by considering the average life expectancy within the original OECD study. The YLL is then adjusted to a local or global valuation perspective.<sup>75</sup> This value is then multiplied by the DALYs from LC-Impact and correcting for inflation to the relevant year.<sup>76</sup>
- b) Altered Ecosystem Services ( $VF_{\text{es}}$ ): The ESVD represents a meta-analysis of 12,390 ecosystem services across six continents, encompassing a wide range of valuation approaches. Common methods in the database include market prices, damage costs, contingent valuation, and choice modelling.<sup>77</sup> In the Water Consumption Methodology, ecosystem services were valued using a published analysis of the ESVD which reported average monetary values of individual ecosystem services across biomes, excluding extreme results and data derived from value transfer.<sup>78</sup>

- c) Financial Costs to Access Future Water ( $VF_{\text{access}}$ ): The valuation considers a replacement cost to access new sources of water. This is done by utilizing a present-day estimate of unit operational cost<sup>79</sup> to produce water supplied from water utilities. The operational cost to produce water represents a conservative lower bound of potential impacts. This is multiplied by the proportion of water contributing to future shortage as defined by the ratio of water demand to supply each year until 2080 and aggregated for each watershed. Future impacts are discounted at 2%<sup>80</sup> and impacts are adjusted to a local or global perspective for each country.<sup>81</sup>

54. Appendix D presents country value factors (Table D1) produced using the valuation methods described above. In addition, Appendix E provides a link to a Water Consumption Value Factor Tool that can assist in determining the local value factor for any location. The distribution of value factors for each impact and some examples are highlighted in Box 1. For countries where data is not available in Table D1, a regional average can be used and has been calculated and provided in Table D2.

55. The value factors will be reviewed and updated regularly. These updates will be made to the value factor only without revision to the methodology itself.

<sup>73</sup>See the Global mean value in Table 6.1 of OECD. (2025). Mortality Risk Valuation in Policy Assessment: A Global Meta-Analysis of Value of Statistical Life Studies.; Range of the global VSL values (95% confidence interval) is between USD 1.9 and 3.6 million.

<sup>74</sup>Inflation adjusted using OECD's Inflation (Consumer Price Index) and Inflation Forecast data series, which can be accessed via: <https://data.oecd.org/price/inflation-cpi.htm>

<sup>75</sup>See Appendix B for more details. In some instances, complementary assessments might be conducted to reflect further utility weighing of the impacts, which site outside of the official methodology. Chapter 7 of Appendix B provides further recommendations for such assessments.

<sup>76</sup>See Appendix B for more detail about the VSL to DALY determination.

<sup>77</sup>See the ESVD for more detail about valuation methods.

<sup>78</sup>See Table 1 in Brander, L. M. et al. (2024). Economic values for ecosystem services: A global synthesis and way forward.

<sup>79</sup>The International Benchmarking Network. (2023). Country Profile United States.

<sup>80</sup>This target social discount rate aligns with other Topic Methodologies.

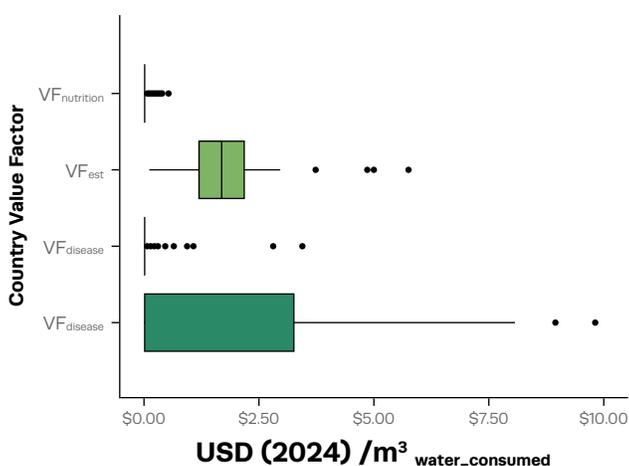
<sup>81</sup>For more information on local and global perspectives, see chapter 6 of appendix B. More guidance on applying the additional utility weighted perspective can also be found in Appendix B, with value factors found in the Value Factor Tool described in Appendix E.

## 4. Outcomes, Impacts, and Valuation

### Box 1. Distribution and Localization of Country Value Factors – Global Perspective

#### Country Value Factors – Global Perspective

The distribution of country value factors, in the global perspective, for each category of impact are presented below. For malnutrition, water-borne disease, and economic costs to access water, most country impacts are relatively small with median values of \$0.01, <\$0.01, and \$0.07 USD (2024) per m<sup>3</sup> water consumed. Though water-borne disease and access impacts are generally small, impacts within select countries are significant. Altered ecosystem services are much more evenly distributed across countries and have a relatively large median of \$1.71 USD (2024) per m<sup>3</sup> water. The economic costs to access water has a cluster of values between \$0 and \$0.07 USD (2024) per m<sup>3</sup> water with a significant number of values that scatter well above \$2.5 USD (2024) per m<sup>3</sup> water consumed. Note that the box-and-whisker figure does not show value factors that are greater than \$10 USD (2024) per m<sup>3</sup> water consumed, as the existence of large outliers make it difficult for clear visualization. Thus, 1 country for VF<sub>disease</sub> and 35 countries for VF<sub>access</sub> are not visualized in the box-and-whisker figure below.

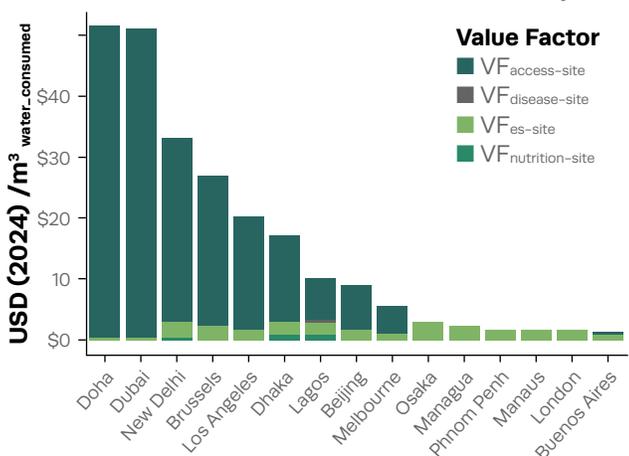


Value	Value Factors				
	VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	VF <sub>H2O,Country</sub>
<b>Five Largest Valuations USD (2024)</b>	\$5.73 (Maldives)	\$0.54 (Nepal)	\$28.18 (South Africa)	\$51.09 (Oman)	\$51.28 (Bahrain)
	\$5.00 (Tuvalu)	\$0.48 (Yemen, Rep.)	\$3.48 (Estonia)	\$51.08 (Qatar)	\$51.28 (Qatar)
	\$4.85 (Kiribati)	\$0.42 (India)	\$2.84 (Ukraine)	\$51.08 (Bahrain)	\$51.27 (Oman)
	\$3.77 (Azerbaijan)	\$0.41 (Pakistan)	\$1.10 (Cameroon)	\$50.61 (United Arab Emirates)	\$50.79 (United Arab Emirates)
	\$2.97 (Finland)	\$0.40 (Bangladesh)	\$1.06 (Chile)	\$46.88 (Saudi Arabia)	\$47.06 (Saudi Arabia)
<b>Median Number of Countries with Value of 0 Lowest non-zero value</b>	\$1.71 (Samoa)	\$0.01 (Antigua and Barbuda)	\$0.00 (North Macedonia)	\$0.07 (American Samoa)	\$2.49 (Curacao)
	0 (Macao SAR, China)	32 (Albania)	15 (Barbados)	90 (Benin)	0 (Macao SAR, China)

#### Site-Specific Value Factors – Global Perspective

The country value factors presented above are to be localized using site-specific data for water stress and biodiversity pressure using equations 3 – 5. The site-specific value factors are then aggregated to determine a local water consumption value factor (VF<sub>H2O-site</sub>) using equation 2.

Examples of site-specific water consumption value factors from selected cities are below. In locations where water scarcity is high, the economic costs to access water are high (e.g. Doha and Dubai). In other locations, altered ecosystem services, water-borne disease, or malnutrition can drive the impacts. The stacked bar chart below shows relative proportions of each value factor for example cities. The table applies equation 2 to determine the site value factor for each city (VF<sub>H2O-site</sub>).



City	Country	VF <sub>H2O,Site</sub>	USD(2024)
Doha	Qatar	\$	51.38
Dubai	United Arab Emirates	\$	51.33
New Delhi	India	\$	32.75
Brussels	Belgium	\$	26.70
Los Angeles	United States	\$	20.29
Dhaka	Bangladesh	\$	16.45
Beijing	China	\$	8.83
Lagos	Nigeria	\$	8.55
Melbourne	Australia	\$	5.53
Osaka	Japan	\$	2.69
Managua	Nicaragua	\$	2.36
Phnom Penh	Cambodia	\$	1.77
Manaus	Brazil	\$	1.65
London	United Kingdom	\$	1.65
Buenos Aires	Argentina	\$	1.20

# 5. Future Development

## 5. Future Development

56. The Water Consumption Methodology represents the current state of knowledge on water consumption impacts and builds upon decades of rigorous scientific work. Nevertheless, opportunities for improvement exist including enhancing water consumption data accounting across the value chain and further development of the valuation of impacts.

57. Opportunities to further advance water consumption impact accounting include:

- a) Improvements in data quality for water consumption accounting. Preparing upstream, direct operations, and downstream documentation of water consumption remains an immense challenge, especially when preparing documentation across multiple geographies. As the desire and expectation to measure and report water consumption increases, there will be an expansion of techniques for determining water consumption and the number of entities conducting water consumption accounting. Though information regarding handling data gaps and uncertainty, handling missing water consumption geographical locations, and opining on specific use cases or scenarios are outside of the scope of the Water Consumption Methodology, future documentation and guidance on these points may be provided in complementary implementation materials.
- b) Increased public disclosure of water consumption data to support the development of water consumption impact accounts. Increased use of reporting standards and disclosure frameworks will augment the availability of value chain water consumption impacts and further standardize data on entities' water consumption.
- c) Advancement to valuation approaches that can determine impacts at finer spatial and temporal resolutions. The type of water (e.g. groundwater vs. surface water), the location (e.g. arid vs. rainy environment), and the time of year (e.g. wet vs. dry season) all affect the impacts of water consumption. Future work will continue to incorporate these considerations to refine water consumption valuation.
- d) New methods that incorporate additional impacts from water consumption such as the impacts of land subsidence and additional opportunity costs that stem from overconsumption of water will be explored for future iterations of the Methodology.
- e) Further clarity around water discharge. The water consumption methodology requires that water discharge occurs in the same geographical location as water consumption. In some cases, an entity may discharge more water than it consumes. More research must be completed to determine if the impacts of this unique case are indeed positive.
- f) Updated valuation method for Financial Costs to Access Future Water. The valuation approach used to estimate the financial cost of accessing future water within the Water Consumption Methodology represents an important area for ongoing improvement. Valuations of future water access carry a high degree of uncertainty and variability and differ significantly based on water stress and geography. Valuation techniques can vary significantly, reflecting the complexity of factors involved, such as potential increases to energy demand, infrastructure requirements, and utility costs. Thus, the present valuation method is intentionally conservative and generalized. Future work will focus on developing a more comprehensive approach that better captures the range of potential costs associated with future water access.
- g) Updates to the minimum option for larger countries. The minimum option is applied when entities lack data on water consumption at a subnational level. In these cases, value factors are based on the average water stress for the entire country. However, water stress can vary significantly within any country, especially those with larger geographic extents. As a result, entities who lack subnational data may be overestimating or underestimating their true impacts when using the minimum option. Future iterations of the Water Consumption Methodology will explore a standard method for applying higher percentiles in countries with a wide range of water stress indices.
- h) Alterations to Hydrology. Infrastructure developments such as dams, reservoirs and diversions can significantly alter natural water cycles by changing flow regimes, evaporation rates, and recharge through percolation. These interventions often increase evaporation due to larger exposed water surfaces, while reducing downstream water availability. Compounding these challenges, climate research suggests

## 5. Future Development

that more frequent extreme weather events will further intensify seasonal and annual variability in water resources. As data availability improves, future iterations of this methodology could incorporate more detailed information on both infrastructure-driven hydrological alterations and climate-induced variability to better capture their combined impacts on water scarcity.

- i) Green Water use and its impact on the natural environment and people. Green water refers to rainwater stored in soil, which, although not directly abstracted by entities, plays a critical role in food security and climate regulation. Excluding green water from the methodology may overlook important aspects such as the influence of land management practices on water retention, particularly in regions reliant on rainfed agriculture. Many disclosure frameworks, such as CDP and the Water Footprint Network, explicitly distinguish between green water and blue water, which refers to surface and groundwater drawn from rivers, lakes, and aquifers. Because green water is intrinsically linked to crop and agricultural production, its impact pathways may differ significantly from those associated with blue water consumption. Further iterations of the Water Consumption Methodology could therefore explore ways to incorporate land management practices and green water impacts into valuation, ensuring a more comprehensive assessment of water scarcity.
- j) Ecosystem Service Valuation. The current Water Consumption Methodology uses ecosystem services values based on published analysis of the ESVD, which reported average monetary values of individual ecosystem services across biomes, excluding extreme results and data derived from value transfer.<sup>82</sup> These ecosystem service values

were used to assign values to biomes within each country (see Appendix B, Section 4 for details). This approach reflects the reality that ecosystem valuation studies are not yet available for all countries, with notable gaps in the Middle East and North Africa (MENA), central Africa, and central Asia. It is important to note, however, that ecosystem services values can vary considerably within the same biome. As a result, the used ecosystem service values may overestimate ecosystem services in some countries while underestimating them in others. This approach will be revised as additional ecosystem services valuation research becomes available, in particular with regard to spatially explicit models that can support more robust benefit transfers in the future.

- k) Inclusion of the impacts of water discharge. The current Water Consumption Methodology does not account for the impacts of corporate water discharge within its value factors. Discharges can alter the natural flow of water, disrupting ecological services and aquatic life. Changes in water temperature (thermal discharges), though often a metric of water pollution and not water consumption, may also place stress on aquatic ecosystems. Beyond ecological effects, altered discharge patterns can affect communities (e.g., increased flood risk, shifts in water availability), agriculture (e.g., changes in hydrology linked to altered discharge locations), and hydrological systems (e.g., impacts on aquifer recharge, streamflow variability, and overall water balance).

58. Significant updates on any of the above, among other developments in the landscape will be used to inform future updates to the Water Consumption Methodology, which will be considered periodically.

<sup>82</sup>See Table 1 in Brander, L. M. et al. (2024). Economic values for ecosystem services: A global synthesis and way forward.

# Appendix A: Glossary

## Appendix A: Glossary

TERM	DEFINITION	SOURCE <sup>83</sup>
<b>Administrative level 1</b>	Administrative 1 is defined as boundaries at the first sub-national level (e.g., States in the United States, Provinces in Canada, or Regions in France.)	FAO
<b>Actual Evapotranspiration (AET)</b>	The quantity of water that is removed from a surface due to the process of evaporation and transpiration and is measured in millimeters (mm).	United States Geological Survey
<b>Biodiversity</b>	The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems.	IPBES
<b>Biome</b>	Global-scale zones, general defined by the type of plant life that they support in response to average rainfall and temperature patterns (e.g., tundra, coral reefs, or savannas)	TNFD
<b>Blue Water</b>	Fresh surface and groundwater, in other words, the water in freshwater lakes, rivers and aquifers.	Water Footprint Network
<b>Cultural services</b>	The intangible benefits related to the perceived or actual qualities of ecosystems, i.e. the non-material benefits from spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including the appreciation of the existence of diverse species.	ESVD / CICES
<b>Direct operations/ Operational processes (gate-to-gate)</b>	Covers activities over which the business has direct operational control, including majority owned subsidiaries.	Capitals Coalition
<b>Disability-adjusted life year (DALY)</b>	One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population.	World Health Organization
<b>Downstream processes (gate-to-grave)</b>	Covers activities linked to the purchase, use, re-use, recovery, recycling, and final disposal of the business' products and services.	Capitals Coalition

<sup>83</sup>Some definitions are adapted from the original source.

## Appendix A: Glossary

TERM	DEFINITION	SOURCE
<b>Ecosystem services</b>	The benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits. Within the Common International Classification of Ecosystem Services (CICES) supporting services such as soil formation, photosynthesis, and nutrient cycling are included under regulating and maintenance services	Millennium Ecosystem Assessment / CICES
<b>Environmentally extended input output models</b>	A family of models designed to bridge the gap between traditional economic calculations, sustainability, and environmental decision-making.	The U.S. Environmental Protection Agency
<b>Green Water</b>	The precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation. Eventually, this part of precipitation evaporates or transpires through plants. Green water can be made productive for crop growth.	Water Footprint Network
<b>Groundwater</b>	Water that is being held in, and that can be recovered from, an underground formation.	GRI
<b>Impact</b>	A positive or negative change in one or more dimensions of people's well-being directly or through a change in the natural environment. In impact accounting, this is expressed in monetary terms.	Impact Management Platform / Capitals Coalition
<b>Impact accounting</b>	The system for measuring and valuing the impacts of corporate entities and generating impact information to inform decisions related to sustainability performance.	GM1
<b>Impact drivers</b>	Refers to the sequence of an entity's inputs and outputs that may have positive and/or negative impacts on people's well-being.	Impact Management Platform / GM1
<b>Impact pathway</b>	The series of consecutive, causal relationships, ultimately starting at an input for an entity's activities and linking its actions with related changes in people's well-being.	ISO / GM1
<b>Input</b>	The resources and business relationships that the entity draws upon for its activities.	Impact Management Platform / GM1
<b>Malnutrition</b>	Refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.	WHO
<b>Outcome</b>	The change in the state or condition capital(s), in physical, biological, psychological, human rights, or equity terms, that results from an entity's activities.	Capitals Coalition
<b>Output</b>	The direct result of an entity's activities, including an entity's products, services, and any by-products.	Impact Management Platform / GM1

## Appendix A: Glossary

TERM	DEFINITION	SOURCE
<b>Produced water</b>	Water that enters the organization's boundary as a result of extraction (e.g., crude oil), processing (e.g., sugar cane crushing), or use of any raw material, and has to consequently be managed by the organization.	GRI
<b>Provisioning services</b>	The products or resources that can be harvested or extracted from ecosystems (e.g., food and raw materials) some of which can be traded in markets.	ESVD / CICES
<b>Rainwater Harvesting</b>	The collection of rainwater runoff for productive purposes.	FAO
<b>Regulating services</b>	The benefits obtained from ecosystem processes that maintain environmental conditions beneficial to individuals and society (e.g., air quality, flood protection, biological control). Under CICES these services are categorized under regulating and maintenance services. Generally, these services have an indirect market value.	ESVD / CICES
<b>Saltwater intrusion</b>	The movement of saltwater into freshwater aquifers. Saltwater intrusion decreases freshwater storage in aquifers, and, in extreme cases, can result in the abandonment of wells. The intrusion of saltwater caused by withdrawals of freshwater from the groundwater system can make the resource unsuitable for use.	The United States Geological Survey
<b>Seawater</b>	Water in a sea or ocean.	GRI
<b>Stakeholders</b>	Stakeholders are defined as those who can affect or be affected by the entity.	EU Commission / ESRS / GM1
<b>Subsidence</b>	The sinking of the ground because of underground material movement, often caused by the removal of water, oil, natural gas, or mineral resources out of the ground by pumping, fracking, or mining activities.	National Oceanic and Atmospheric Administration
<b>Surface water</b>	Water that occurs naturally on the Earth's surface in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers, and streams.	GRI
<b>Transpiration</b>	The evaporation of water from plants through small openings found on the underside of leaves.	National Oceanic and Atmospheric Administration
<b>Upstream processes (Cradle-to-gate)</b>	Covers the activities of suppliers, including purchased energy.	Capitals Coalition
<b>Value factor</b>	Value factors help to translate the impact drivers of an entity into estimations of the relative importance, worth or usefulness of impacts to the people who experience the impact, expressed as a monetary value.	GM2 / Capitals Coalition

## Appendix A: Glossary

TERM	DEFINITION	SOURCE
<b>Value of a statistical life</b>	The amount individuals would be willing to pay or to accept to experience small changes in mortality risk, aggregated to estimate the monetary value of a reduction in mortality risk of 100%.	US EPA
<b>Water stress (WS)</b>	The ability, or lack thereof, to meet the human and ecological demands for water. <sup>84</sup> Water risk, <sup>85</sup> more broadly, considers water stress as well as accessibility of water and regulatory or reputational issues.	EU Commission/ESRS
<b>Water consumption</b>	The amount of water drawn into the boundaries of the undertaking (or facility) and not discharged back to the water environment or a third party over the course of the reporting period.	EU Commission/ESRS
<b>Water withdrawal</b>	The sum of all water drawn into the boundaries of the undertaking from all sources for any use over the course of the reporting period.	EU Commission/ESRS
<b>Water discharge</b>	Sum of effluents, used water, and unused water released to surface water, groundwater, seawater, or a third party, for which the organization has no further use, over the course of the reporting period.	GRI
<b>Water-borne disease</b>	Diseases caused by consuming contaminated water. Examples include diarrhea, cholera, dysentery, and typhoid.	WHO
<b>Water access</b>	The sustainable and equitable availability of clean and potable water sources for future use.	N/A
<b>Well-being</b>	Well-being is the state of being or doing well in life; happy, healthy, or prosperous condition; moral or physical welfare. According to the OECD Well-being Framework, well-being encompasses 11 dimensions of current well-being and 4 dimensions for future well-being.	Impact Management Platform OECD

<sup>84</sup>Definition adapted from GRI. (2018). GRI 303: Water and effluents

<sup>85</sup>As defined in ESRS. (2022). E3: Water and marine resources.

# Appendix B: Methodological Details

# Appendix B: Methodological Details

## TABLE OF CONTENTS

1. Introduction .....	39
2. Affected Health from Malnutrition .....	39
3. Affected Health from Water-borne Disease .....	40
4. Altered Ecosystem Services .....	41
5. Financial Costs to Access Future Water .....	42
6. Strategies for gap-filling and Outlier Exclusion .....	43
7. Local vs. Global vs. Utility Weighted Perspectives .....	44

## Appendix B: Methodological Details

### INTRODUCTION

B1. Four categories of value factors were developed to determine water consumption impacts: affected health from malnutrition, affected health from water-borne disease, altered ecosystem services, and financial costs to access future water. For each category, a wide array of approaches were considered ranging from techniques in the academic and business literature to methods developed internally. The value factors presented considered the valuation techniques, the recency of the underlying data, the spatial extent and resolution, the physical or socioeconomic sophistication in the underlying models, and the assumptions made in each step.

B2. The details of how each value factor is determined can be found in the sections below.

### AFFECTED HEALTH FROM MALNUTRITION

B3. The deprivation of a unit of water to agricultural users is represented by affected health from malnutrition. This category assumes that the deprivation of water to agricultural users reduces the caloric production of staple crops, leading to increased rates of malnutrition. Affected health from malnutrition is provided at a country level using the following equation:

$$CF_{mal,c} \times \$_{DALY,c} = VF_{nutrition}$$

Where  $CF_{mal,c}$  is a characterization factor describing the DALYs caused by water stress-related malnutrition in country  $c$  and  $\$_{DALY,c}$  is the valuation of a DALY used for country  $c$ . More details on these variables can be found in the paragraphs below. A detailed discussion on the perspectives used to value DALYs can be found in section 7.

B4. Malnutrition impacts are based on water use-related human health characterization factors (CFs) provided by LC-Impact.<sup>86</sup> LC-Impact was chosen as a significant advancement from ReCiPe2016<sup>87</sup> by providing updated water stress data, and ReCiPe2008<sup>88</sup> by providing CFs on a global scale with more expansive water use impacts. Here, CFs are defined as values that indicate environmental impact per unit stressor (e.g., per cubic meter of water consumed).

B5. LC-Impact CFs utilize a cause-effect chain relating water stress to malnutrition. The final CFs represent malnutrition impacts in units of DALYs per cubic meter of water consumed.

B6. Within LC-Impact's methodology, water stress is represented by a water stress index (WSI) originally developed by Pfister et al. (2009) that is the ratio between the sum of freshwater withdrawals for different sectors and the hydrological availability within a particular watershed.<sup>89</sup> WSI also incorporates inter-annual variation in both water withdrawals and hydrological availability, where increased withdrawals and/or lower water availability leads to increased WSI values. This is completed by calculating the multiplicative standard deviations of monthly and annual precipitation for the years 1961–1990, assuming a log-normal distribution, and aggregated to a watershed level.

B7. LC-Impact then relates water stress indices to human health related damages to determine malnutrition impacts in DALYs per cubic meter of water consumed. This is completed by the multiplication of a fate factor, an effect factor, and a damage factor. The fate factor (units of  $m^3$  deprived per  $m^3$  consumed) is determined by multiplying the WSI by the percentage of water extracted by agriculture. The effect factor (units of  $capita \cdot year$  per  $m^3$  deprived) represents the number of malnourished people per quantity of water deprived within a watershed, incorporating a standard per-capita water requirement to prevent malnutrition ( $1,350 m^3$  per capita per year), multiplied by a human development factor (HDI). The HDI is represented by a polynomial fit of malnutrition-related DALY values to national HDI reports. Finally, the damage factor (units of DALYs per year per capita) represents a country-level linear regression of malnutrition rates by DALY malnutrition rates. The multiplication of the fate, effect and damage factors creates CFs in units of DALYs per cubic meter of water consumed.

B8. LC-Impact provides two methods for characterizing the final DALYs per cubic meter of water consumed: *marginal CFs* and *average CFs*. *Marginal CFs* are typically used in Life Cycle Analyses to address marginal changes in rates of water consumption (i.e., additional pulses of water consumption), where

<sup>86</sup>LC-Impact. n.d. LC-Impact: A spatially differentiated life cycle impact assessment method.; Pfister, S. et al. (2021). 12. Water Stress.

<sup>87</sup>Huijbregts, M. A. J. et al. (2016). ReCiPe 2016 v1.1: A harmonized life cycle impact assessment method at midpoint and endpoint level. Report 1: Characterization.

<sup>88</sup>Goedkoop, M. et al. (2009). Recipe 2008: A life cycle impact assessment method which comprises harmonised category indicators at the midpoint and endpoint level.

<sup>89</sup>Pfister, S. et al. (2009). Assessing the environmental impacts of freshwater consumption in LCA.

## Appendix B: Methodological Details

average CFs are used to assess the current total impacts of water consumption within a region. The Water Consumption Methodology utilizes LC-Impact's marginal CFs.<sup>90</sup>

B9. The DALYs from LC-Impact were converted to currency by determining the value of a DALY from a *value of a statistical life* (VSL). The VSL is frequently used in the monetary valuation of human mortality risk, and has been applied in many government, multilateral, academic, and corporate impact contexts. The VSL is the amount individuals would be willing to pay or to accept to experience small changes in mortality risk, which is then aggregated to estimate the monetary value of a reduction in mortality risk of 100%.<sup>91</sup> The VSL is not an estimate of any individual's willingness to pay to prevent (or willingness to accept to endure) certain death and does not place a monetary value on individual lives.

B10. The OECD estimate of \$2,895,021 USD (2024) was used as the basis of the VSL valuation. This is based on a VSL of \$2.7 million USD (2022)<sup>92</sup> adjusted for inflation using the OECD's Inflation (Consumer Price Index) and Inflation Forecast data series.<sup>93</sup> This value represents an update in the VSL evaluation from a previous 2012 OECD study<sup>94</sup>

B11. Estimates of the VSL do vary empirically by subpopulation, reflecting both income differences (i.e., willingness to pay is constrained by ability to pay) as well as genuine differences in attitudes toward health risk.<sup>95</sup> National and local VSLs may therefore be valuable in complementary analyses of impact accounts. The VSL is converted into a valuation of one year of life lost (YLL) by dividing the VSL by the remaining life expectancy of the respondents included within the meta-analysis (31 years, represented by the global life expectancy of 72.6 years in 2022<sup>96</sup> minus the average age of the respondents in the study,

41.6 years<sup>97</sup>). For equity reasons, no age-weighting or income-adjusting techniques were utilized.<sup>98</sup> This resulted in the value of a DALY, represented by one YLL, of \$93,388 USD (2024).

B12. Within the Water Consumption Methodology, the valuation of YLL is adjusted and applied to each country differently based on whether a local, global, or utility weighted perspective is chosen by the entity for analysis. To see more information regarding these perspectives, refer to Section 7.

### AFFECTED HEALTH FROM WATER-BORNE DISEASES

B13. The deprivation of a unit of water to domestic users is represented by affected health through water-borne illnesses. This category assumes that corporate water consumption increases domestic water scarcity, leading to a reduction of access to safe drinking water. This loss of access to safe drinking water increases the risk of contracting water-borne illnesses where water sanitation infrastructure is lacking. Other parameters such as health care expenditure and house connection to sanitation have strong effects on this relationship and cannot be ignored. Affected health from water-borne diseases is provided at a country level using the following equation:

$$CF_{disease,c} \times \$_{DALY,c} = VF_{disease}$$

Where  $CF_{disease,c}$  is a characterization factor describing the DALYs caused by water stress-related diseases in country  $c$  and  $\$_{DALY,c}$  is the valuation of a DALY used for country  $c$ . More details on these variables can be found in the paragraphs below. A detailed discussion on the perspectives used to value DALYs can be found in Section 7.

<sup>90</sup>Marginal CFs can be found in Table 12.1 of Pfister, S. et al. (2021). 12. Water Stress. Upon the author's recommendations, 20 country values have been updated more recently than this publication itself in the Water Consumption Methodology. These 20 countries are Fiji, Finland, Guinea-Bissau, Iran, Jamaica, Kenya, Madagascar, Malaysia, Montenegro, Niger, Nigeria, Romania, Russia, Senegal, Serbia, Sudan, Suriname, Thailand, Uganda, and Zambia.

<sup>91</sup>United States Department of Transportation. (2021). Treatment of the value of preventing fatalities and injuries in preparing economic analyses; United States Environmental Protection Agency. (2024). Mortality Risk Valuation.

<sup>92</sup>OECD. (2025). Mortality Risk Valuation in Policy Assessment: A Global Meta-Analysis of Value of Statistical Life Studies.

<sup>93</sup>Inflation adjusted using OECD's Inflation (Consumer Price Index) and Inflation Forecast data series, which can be accessed via: <https://data.oecd.org/price/inflation-cpi.htm>

<sup>94</sup>Biausque, V. (2012). The Value of Statistical Life: A meta-analysis.

<sup>95</sup>Biausque, V. (2012). The Value of Statistical Life: A meta-analysis.; Health and Safety Executive. (2020). A scoping study on the valuation of risks to life and health: the monetary Value of a Life year (VOLY).

<sup>96</sup>United Nations. (2024). World Population Prospects 2024.

<sup>97</sup>See table A C.5. in OECD. (2025). Mortality Risk Valuation in Policy Assessment: A Global Meta-Analysis of Value of Statistical Life Studies.

<sup>98</sup>Arnesen, T., & Nord, E. (1999). The value of DALY life: problems with ethics and validity of disability adjusted life years.

## Appendix B: Methodological Details

B14. To represent the effect of water consumption on the spread of water-borne disease ( $CF_{\text{disease},c}$ ), country-level estimates were based on research provided by Motoshita et al (2011).<sup>99</sup> Motoshita et al. (2011) makes use of multiple regressions relating water scarcity to DALY estimates for diarrheal, ascariasis, trichuriasis, and hookworm disease. This was completed through the creation of two distinct modules: a water accessibility assessment module and a health damage assessment module.

B15. The water accessibility assessment module was represented via a regression analysis where house connection to water supply was predicted by three explanatory variables: domestic use of freshwater, GDP per capita, and gross fixed capital formation expenditure per capita. The results of the regression describe the changes to house connection to water supply caused by unit changes to domestic water use.

B16. The health damage assessment module assessed changes to health damage data (DALYs) for water-borne disease predicted by seven explanatory variables: average annual temperature, house connection to water supply, house connection to sanitation, average dietary consumption, undernourished population rate, the Gini coefficient of dietary energy consumption, and health expenditure per capita. One regression was done for each disease. The results of the health damage assessment module were used to predict the damage to human health caused by a unit change in the house connection to water supply.

B17. By combining the water accessibility and health damage assessment modules, the effect of water-borne disease damage caused by the shortage of a unit volume of domestic water could be calculated based on the data of domestic fresh water use in each country and represented in terms of DALYs per cubic meter of water deprived from domestic water use.<sup>100</sup>

B18. DALYs were monetized in the same manner as used in the malnutrition category described in paragraphs B10–12. Further details around how the valuation of a DALY was transformed into a local, global, or utility weighted perspective are provided in section 7.

### ALTERED ECOSYSTEM SERVICES (ES)

B19. The deprivation of a unit of water to the natural environment is represented via altered ecosystem services. This category is framed under the assumption that nature needs water to sustain the ecosystem services that support human life.

B20. The ES impacts were developed by utilizing biome-level ES values, considering the water needs for each biome, and assessing the coverage of each biome at the national level.

B21. Biome-level ES values in the Water Consumption Methodology are based ecosystem services values published by an analysis of the ESVD, which reported average monetary values of individual ecosystem services across biomes, excluding extreme results and data derived from value transfer.<sup>101</sup> The ESVD is a global meta-analysis of 12,390 ES estimates across 6 continents. The ES values are represented among 23 individual ecosystem services that fall into three main categories – provisioning services, regulating services, and cultural services.<sup>102</sup> The biomes considered include coastal wetlands, inland wetlands, freshwater (rivers/lakes), tropical forests, temperate forests, woodlands, grasslands, deserts, snow/ice, and croplands. Urban, marine, and coral reef biome types in the ESVD were excluded from the analysis as water consumption was not likely to affect these categories. Further, all ecosystem services except for food production and water provisioning were included in the analysis. These were removed to avoid double counting of impacts with the malnutrition and water-borne disease impacts.

B22. ESVD values, in dollars per hectare per year at 2020 price levels, were represented as averages and categorized by biome and associated ecosystem services using data provided by Brander et al. 2024.<sup>103</sup> In the study, averages were calculated after excluding bundled valuations (those incorporating multiple services or biomes) and removing outliers using a two-tiered process: first, excluding values beyond 1.5 times the interquartile range of log-transformed data, and second, manually excluding extreme valuations based on their biophysical and socio-economic context. Within the

<sup>99</sup>Motoshita, M. et al. (2011). Development of impact factors on damage to health by infectious diseases caused by domestic water scarcity.

<sup>100</sup>For more information, refer to Section 3.3, Damage factors in each country of: Motoshita, M. et al. (2011). Development of impact factors on damage to health by infectious diseases caused by domestic water scarcity.

<sup>101</sup>Brander, L. M. et al. (2024). Economic values for ecosystem services: A global synthesis and way forward.

<sup>102</sup>For definitions of these categories, see the Glossary.

<sup>103</sup>See Table 1 in Brander, L. M. et al. (2024). Economic values for ecosystem services: A global synthesis and way forward.

## Appendix B: Methodological Details

Water Consumption Methodology, food provisioning services were excluded from the biome-level averages to avoid double-counting with the malnutrition impact. Brander et al. 2024 noted that very few studies represented deserts and semi-deserts. As a result, these biomes were valued using the estimates for shrubland and shrubby woodlands within the Water consumption Methodology. Values were adjusted for inflation by using data provided by the Bureau of Economic Analysis National Income and Product Accounts.<sup>104</sup>

B23. To assess the impacts of water consumption on ecosystem services, an assessment of how much water a biome requires was needed. Actual evapotranspiration (AET) was selected as a proxy for biome water requirements as it represents the amount of water transferred from Earth's surface to the atmosphere through both soil evaporation and transpiration. These two metrics act as a proxy for many other ecologically relevant variables including solar radiation, air temperature, relative humidity, wind speed, as well as other characteristics related to ecosystem health. The Water Consumption Methodology utilizes the annually averaged AET dataset from 2024 provided by the United States Geological Survey's (USGS) FEWS NET Data Portal.

B24. AET values (in mm / year) were extracted by the locations of ESVD valuations (in dollars per square meter per year) using the *sample raster values* tool in QGIS.<sup>106</sup> Extracted AET values were then merged with the ESVD database and averaged to the biome level. Finally, ESVD valuations were divided by AET estimates to determine the impact of depriving a biome of each unit of water on ES valuation via:

$$\frac{\text{USD}(2024)_{\text{biome}}}{\text{m}^2 \cdot \text{yr}} \times \frac{\text{yr}}{\text{mm}_{\text{AET}}} \times \frac{1,000 \text{ mm}}{\text{m}_{\text{AET}}} = \frac{\text{USD}(2024)_{\text{biome}}}{\text{m}^3 \text{H}_2\text{O deprived}}$$

B25. To convert from biome estimates to national estimates, the total land extents of each biome for each country was used. Satellite coverage values from Song et al. (2018) were utilized as they harmonized data from nine different satellite-based land cover

maps into biome categorizations defined by the ESVD itself.<sup>107</sup> Using these data and country-level administrative border polygons provided by the World Bank,<sup>108</sup> the biome composition for each country was determined using the *Zonal Histogram* tool from QGIS.

### FINANCIAL COSTS TO ACCESS FUTURE WATER

B26. The deprivation of a unit of water for future use is represented via a financial cost of access to future water. This category is framed under the assumption that unsustainable sources of water will be depleted when projected water demand in a location outweighs projected renewable water supply and that future impacts are driven by present water consumption.

B27. In many areas of the globe, the demand for clean freshwater is higher than the available renewable surface and groundwater supply. Where current-day water demand outweighs the water renewal rate, water extraction deprives access of water for future use.

B28. To value this phenomenon, baseline (present-day) and future metrics for water stress (WS) were extracted from the World Resource Institute's AQUEDUCT Water Risk Atlas.<sup>109</sup> Here, baseline and future WS are represented by the ratio of total water demand for domestic, industrial, irrigation, and livestock consumptive and non-consumptive uses to the available renewable surface and groundwater supplies at a sub-watershed level. AQUEDUCT's baseline WS metric is calculated using sub-watershed data sourced from PCR-GLOWB2.<sup>110</sup> Baseline WS data is represented by an average of twelve water stress time series (one for each month, 1979–2019) weighted by total demand, so that months with higher demand have more influence on the annual WS values.<sup>111</sup> Future projections are based on three, 30-year periods centered on the years 2030, 2050, and 2080, provided by the PCR-GLOWB-based hydrological projection of future global water stress with CMIP 6 (HYPFLOWSCI6).<sup>112</sup>

B29. Baseline and future WS data were extracted from GitHub<sup>113</sup> and analyzed and cleaned in R<sup>114</sup> so that WS

<sup>104</sup>U.S. Bureau of Economic Analysis. (2024). Table 1.1.9. Implicit price deflators for gross domestic product.

<sup>105</sup>FEWS NET; USGS Data Portal. (2024). Annual Actual Evapotranspiration (ET).

<sup>106</sup>QGIS software can be accessed QGIS.org; QGIS Association: QGIS Geographic Information System.

<sup>107</sup>Song, X.-P. (2018). Global Estimates of Ecosystem Service Value and Change: Taking Into Account Uncertainties in Satellite-based Land Cover Data.

<sup>108</sup>World Bank. (2025). World Administrative Boundaries – Countries and Territories.

<sup>109</sup>Kuzma, S. et al. (2023). Aqueduct 4.0: Updated decision-relevant global water risk indicators.

<sup>110</sup>Sutanudjaja, E. H. et al. (2018). PCR-GLOBWB 2: a 5 arcmin global hydrological and water resources model.

<sup>111</sup>Kuzma, S. et al. (2023). Aqueduct 4.0: Updated decision-relevant global water risk indicators.

<sup>112</sup>Sutanudjaja, E. H. (2023). HYPFLOWSCI6: HYdrological Projection of Future gLObal Water States with CMIP6.

## Appendix B: Methodological Details

values and projections for present, 2030, 2050, and 2080 were represented for each sub-watershed. Rows where country names or WS scores were missing (error code, -9999) were removed. To ensure the analysis only includes sub-basins where human extraction occurs, sub-basins labelled as *arid and low water use* were omitted from the analysis. The inclusion or continued exclusion of these sub-basins will change as new data updates get published from AQUEDUCT.

B30. Linear regressions ( $WS \sim \text{time}$ ) for each sub-watershed were applied from present day to 2080. Linear regression formulas were used to extrapolate the WS value for each individual year between present-day and 2080.

B31. The WS value represents the degree to which water extraction is above or below a sustainable rate and is based on the ratio of water demand to water supply in each year.<sup>115</sup> Within the Water Consumption Methodology, a sustainable rate of extraction is defined as a  $WS < 1$  and, therefore, any year or watershed where  $WS$  is  $< 1$ , no shortage exists and no cost was applied. For  $WS$  values above 1, a proportion of the present water consumption is driving future shortage. Future generations will have to resolve this shortage, leading to financial costs. The proportion above the sustainable rate was considered as  $(WS-1)/(WS)$ . This ratio is multiplied by a cost (the cost to supply water) to represent the increase in price of obtaining water in the future because of scarcity in supply.

B32. Once the proportion of water extraction exceeding sustainable rate were determined at the sub-basin level, results were aggregated to country (Administrative 0) and sub-country (Administrative 1) levels. Aggregation was based on weighted averages, with weights determined by the relative sizes of sub-basins within each administrative unit.<sup>117</sup>

B33. Precisely how much higher future prices will be relative to current prices is unknown but can be conservatively estimated using the International

Benchmarking Network's price of unit operation costs for water extraction in the U.S.<sup>118</sup> This value was then adjusted for inflation to 2024 and transferred to other countries under three different perspectives: the local perspective, global perspective, and utility weighted perspective. Further descriptions of these perspectives and their application can be found in Appendix B, Section 7. A 2% social discount rate was applied to values after 2024. Once prices were applied to each year where water demand outweighed water supply and the discounting factor was applied, all values for each sub-watershed were summed together to represent the resource cost at a sub-watershed level. These values were then aggregated to the national level by a weighted average of the water cost, with the weight represented by the sub-watershed size.

### STRATEGIES FOR GAP FILLING AND OUTLIER EXCLUSION

B34. Gap filling was conducted at the country level using World Bank regional and income classifications.<sup>119</sup> Where country-level data was not available for a given pathway, we applied a hierarchical approach to gap filling: (1) fill gaps using the average of countries in the same combined region-income cohort; (2) if no such average could be calculated, use the regional average; and (3) if the regional average was also unavailable, use the income-class average.

B35. Outliers were identified by applying a common outlier exclusion rule (OER), defined as values falling more than 1.5 times the interquartile range (IQR) beyond the first or third quartile of the log-transformed outcomes. For the malnutrition and infectious disease pathways, the OER was applied to the DALY/m<sup>3</sup> water consumed estimates provided by LC-Impact and Motoshita 2011, respectively (see Appendix B, sections 2 and 3 for more details). Outliers were excluded using a similar OER within the Brander et al. 2024, with some additional implications (See paragraph B22 for more details). For the Financial Costs to Access

<sup>113</sup>World Resource Institute. (2023). Aqueduct 4.0 Water Risk Atlas Data Dictionary.

<sup>114</sup>R Core Team (2023). A language and environment for statistical computing.

<sup>115</sup>Defined by Aqueduct: Baseline water stress measures the ratio of total water demand to available renewable surface and groundwater supplies. Kuzma, S. et al. (2023). Aqueduct 4.0: Updated decision-relevant global water risk indicators.

<sup>116</sup>Country-level and administrative 1 boundaries applied within the Water Consumption Methodology align with distinctions outlined by the World Bank. Administrative 1 refers to the highest level administrative divisions within a country after the national level. World Bank. (2025). World Administrative Boundaries - Countries and Territories.

<sup>117</sup>Sub-basin areas can be viewed within the baseline dataset (column `area_km2`) of Aqueduct. World Resource Institute. (2023). Aqueduct 4.0 Water Risk Atlas Data Dictionary.

<sup>118</sup>The International Benchmarking Network. (2023). Country Profile United States.

<sup>119</sup>The World Bank. (2025). The World by Income and Region.

## Appendix B: Methodological Details

Future Water pathway, OER was applied the proportion of water extraction exceeding sustainable rate (see Appendix B, Section 5 for more details). Flagged outliers were replaced with region-income cohort averages.<sup>120</sup>

B36. To see where gap-filing and outlier exclusion was applied, refer to Appendix D and Table D1. Averages for region, income, and region-income cohorts can be found in Table D2.

### LOCAL, GLOBAL, AND UTILITY-WEIGHTED PERSPECTIVES

B37. Monetary valuations are often transferred between countries by adjusting values by a metric such as Purchase Power Parity (PPP). However, adjusting valuations for purchasing power alone can lead to unintended consequences, such as expressing impacts as lower in low-income countries versus high income countries. To combat these issues when currencies are adjusted, the Water Consumption Methodology allows for value factors to be adjusted to local, global, and utility weighted perspectives.<sup>121</sup>

B38. Local, global, and utility weighted transformations are applied to each of the four pathways of the Water Consumption Methodology separately. For the Malnutrition and infectious disease pathways, the transformation is applied to the YLL/DALY valuation.<sup>122</sup> For the ecosystem services pathway, the transformation is applied to the ecosystem service valuations extracted from the ESVD.<sup>123</sup> For the access to future water pathway, the transformation was applied to the IB-net valuation for US unit operation cost.<sup>124</sup>

B39. In the local perspective, results are aligned with the actual prices and the local context. This perspective is relevant when using impact accounting within a single jurisdiction (e.g., Managers of the entity

making decisions at a local context or operating in a single country). In the Water Consumption Methodology, the local perspective value factors should not be utilized when making cross-country comparisons.

B40. The global perspective avoids differences in impact accounts that are only driven by price-level differences and not by performance. This perspective is intended to remove disparities related to income effects. This perspective is relevant when using impact accounting across jurisdictions or presenting results to cross-country stakeholders removing the influence of income. In the Water Consumption Methodology, the global perspective value factors should not be utilized when making analyses only within a single country.

B41. The utility weighted perspective is not part of the official Water Consumption Methodology but can be used for complementary assessments. This perspective is an extension of the global perspective, but accounts for higher marginal sensibility to impacts in lower income countries and lower marginal sensibility to impacts in higher income countries. The utility weighted perspective provides additional considerations for recognizing different well-being implications from marginal effects. In the Water Consumption Methodology, utility weighted value factors should not be utilized when making analyses only within a single country, similar to the global perspective. Utility weighted value factors can be selected if the entity wishes to present results to stakeholders to illustrate the implications of addressing additional equity concerns.

B42. To understand the calculations behind the local, global and utility weighted perspectives, please refer to the table below.

<sup>120</sup>Within the current draft of the Water Consumption Methodology, the only outlier flagged was South Africa's infectious disease valuation, which was replaced with the Sub-Saharan Africa/upper middle income cohort average.

<sup>121</sup>Please note that the utility weight perspective is outside of the official methodology and should be considered for additional, complementary assessments.

<sup>122</sup>For more information, refer to section 2 and 3 of Appendix B.

<sup>123</sup>For more information, refer to section 4 of Appendix B.

<sup>124</sup>For more information, refer to section 5 of Appendix B.

## Appendix B: Methodological Details

Pathway	Perspective	Description
Malnutrition/ Disease <sup>125</sup>	Local	$\$YLL_{local} = \frac{GNI\ PPP_{per\ capita,c}}{GNI\ PPP_{per\ capita,United\ States}} \times \$YLL$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNI_PPPper capita,United States is the gross national income for the United States, and \$YLL is the global valuation of a year of life lost (\$93,388 USD2024).</p>
Malnutrition/ Disease	Global	\$YLL <sub>Global</sub> = \$YLL = \$93,388. USD(2024), applied universally to all geographies.
Malnutrition/ Disease	Utility	$\$YLL_{Utility} = \left( \frac{GNI\ PPP_{per\ capita,c}}{GNI_{per\ capita,LCU}} \right)^{\epsilon} \times \$YLL$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNIper capita, LCU is the World Gross national income per capital in local currency units, and \$YLL is the global valuation of a year of life lost (\$93,388 USD2024).</p>
Ecosystem Services	Local	$\$ES_{local,biome} = \frac{GNI\ PPP_{per\ capita,c}}{GNI_{per\ capita,United\ States}} \times \$ES_{biome}$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNI_PPPper capita,United States is the gross national income for the United States, and \$ESbiome is the total ecosystem services valuation for each biome.</p>
Ecosystem Services	Global	Values extracted from the ESVD are already within the global perspective and are represented in units of international dollars per hectare per year.
Ecosystem Services	Utility	$\$ES_{local,biome} = \left( \frac{GNI\ PPP_{per\ capita,c}}{GNI_{per\ capita,LCU}} \right)^{\epsilon} \times \$ES_{biome}$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNIper capita, LCU is the World Gross national income per capital in local currency units, and \$ESbiome is the total ecosystem services valuation for each biome.</p>
Access to future water	Local	$\$X_{local} = \frac{GNI\ PPP_{per\ capita,c}}{GNI_{per\ capita,United\ States}} \times \$X$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNI_PPPper capita,United States is the gross national income for the United States, and \$X is the IB-Net valuation for US Unit Operation Cost (\$1.42).</p>
Access to future water	Global	\$X <sub>Global</sub> = \$X = \$1.47 USD(2024), applied universally to all geographies.
Access to future water	Utility	$\$X_{local,biome} = \left( \frac{GNI\ PPP_{per\ capita,c}}{GNI_{per\ capita,LCU}} \right)^{\epsilon} \times \$X_{biome}$ <p>Where GNI_PPPper capita,c is the gross national income for country c, GNIper capita, LCU is the World Gross national income per capital in local currency units, and \$X is the IB-Net valuation for US Unit Operation Cost (\$1.42).</p>

Table B1. How local, global and utility weighted perspectives are applied to each pathway in the Water Consumption methodology.

<sup>125</sup>Though the YLLs represented are different between the malnutrition and infectious disease pathways, the math behind the transformations are identical.

# Appendix C: Assessing Local Water Stress and Biodiversity Pressure

# Appendix C: Accessing Local Water Stress and Biodiversity Pressure

C1. This section provides guidance on how to obtain local water stress ( $WS_{local}$ ) and biodiversity pressure ( $BD_{local}$ ) for each location of water consumption. Local water stress is obtained from the Aqueduct Water Risk Atlas while local biodiversity pressure is obtained from the WWF Biodiversity Risk Filter.

C2. The guidance below is meant to assist preparers of Water Consumption Impact Accounts, particularly those new to these tools. The guidance does not serve as a definitive resource on obtaining these values and is subject to change based on updates from the organizations that host each of the tools.

## LOCAL WATER STRESS ( $WS_{LOCAL}$ ) FROM THE AQUEDUCT WATER RISK ATLAS

C3. Begin by navigating to the Aqueduct Website<sup>126</sup> and launching the “Aqueduct Water Risk Atlas”. This will open a global map with a list of “Indicators” to select from on the left side of the screen.

C4. Select the “Water Stress” indicator to display it on the map. Ensure that the “Temporal resolution” is “Annual”. Using the map tools, navigate to the first location of water consumption of the entity.

C5. The “Analyze” tool, located on the bottom left of the screen, will allow the preparer to access local site Water Stress. Once the “Analyze” tool is open, there are options to locate sites by either clicking on the map or entering the address of the site.<sup>127</sup>

- To use the “click map tool”, press the “Click Map” button which will allow for each site of water consumption to be entered by clicking on the map.
- To enter an address, press the “Enter Address” button which will bring up a dialog box that allows for an address, decimal degrees, or coordinates to be entered. Once the address is located, the box will close, and a point will be placed on the map in that location.

C6. As each location is entered, a table begins to populate in the bottom left of the screen with some metadata about each location. This table does not

present the local water stress needed to apply the Water Consumption Methodology.

C7. Once all sites of water consumption have been populated in the table, it can be downloaded as a spreadsheet (.csv) or geospatial file (.gpkg). The following describes how to obtain the data from the spreadsheet (.csv).

C8. Once the spreadsheet is downloaded and opened, navigate to the “bws\_score”<sup>128</sup> column. The data in this column is the local water stress ( $WS_{local}$ ) to be used in the Water Consumption Methodology.

C9. Other tools in the Aqueduct Water Risk Atlas and data extracted may provide useful context for preparers but should not be used or manipulated to replace the local water stress factor described above.

C10. For additional guidance on how to use the Aqueduct Water Risk Atlas see the Frequently Asked Questions<sup>129</sup> and the manuals and publications.<sup>130</sup>

## LOCAL BIODIVERSITY PRESSURE ( $BD_{LOCAL}$ ) FROM THE WWF BIODIVERSITY RISK FILTER

C11. To access the local biodiversity pressure data, begin by registering for a free WWF Risk Filter Suite account.<sup>131</sup> Once an account has been made and the preparer is logged in to the website, navigate to the “Portfolio Manager” by clicking the button at the top right of the screen or navigating via the dropdown menu under the Biodiversity Risk Filter tab. Once in the Portfolio Manager, make a company by entering the details of the company of interest.

C12. Next, navigate to the “Sites” button in the center of the page. This is where each location of water consumption will be entered to obtain the local biodiversity pressure data. There are options for entering sites one at a time or to import a set of sites together in a single file.

- To add sites individually, click “Add Single Site” which will bring up a dialog box with various details to be entered for the site. Company name, Site name, Industry, Business importance, and Location

<sup>126</sup><https://www.wri.org/aqueduct>

<sup>127</sup>There is also an option to import a .csv or .xlsx file with addresses, but this is still under development.

<sup>128</sup>This abbreviation means “baseline water stress score”

<sup>129</sup>FAQs: <https://www.wri.org/aqueduct/faq>

<sup>130</sup>Publications: <https://www.wri.org/aqueduct/publications>

<sup>131</sup>Site to register: <https://riskfilter.org/register>

are all required variables. Selecting the correct Industry is necessary as it will influence the Pressure on Biodiversity value. To add a location, use the search box to find a location or click on the map. Once complete, click "Save" at the bottom of the box.

- d. To add multiple sites, click "Add Multiple Sites" which will bring up a box to upload an excel file. This also provides a template file for how to provide the data. The excel template has a Help tab to aid in entry. Once the file is complete, uploaded it to the Portfolio Manager.

C13. Once all sites have been entered, they should be visible on the Sites page of the Portfolio Manager.

C14. Navigate back to the "Company & Groups" page of the Portfolio Manager by clicking the button in the center of the screen. Once there, click the green "Analyze Biodiversity" button beside the company of interest. This will take you to a global map where each

variable can be explored visually.

C15. Navigate to the "Details" page by clicking the button in the center of the page. This page will present various graphs for the user to explore. To obtain the biodiversity pressure click the "Export to Excel" button at the top right of the screen.

C16. Once the spreadsheet is downloaded and opened, navigate to the "Pressures on Biodiversity" column. The data in this column is the local biodiversity pressure ( $BD_{local}$ ) to be used in the Water Consumption Methodology.

C17. Other tools in the WWF Risk Filter Suite and data extracted may provide useful context for preparers but should not be used or manipulated to replace the local biodiversity pressure described above.

C18. For additional guidance on how to use the WWF see the Frequently Asked Questions<sup>132</sup> and the manuals and reports.<sup>133</sup>

<sup>132</sup>FAQs: <https://riskfilter.org/#faq>

<sup>133</sup>Reports: <https://riskfilter.org/risk-reports>

# Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

D1. Table D1 provides national value factor, water stress, and biodiversity pressure values in the global perspective.<sup>134</sup> Using the preferred option to apply the methodology, the national value factors should be converted to more geographically precise value factors using the monetary valuation approach described in the Section 4.3 of the Water Consumption Methodology.<sup>135</sup> The national water stress and biodiversity pressure values are made accessible here but can also be obtained from Aqueduct Water Risk Atlas or WWF Biodiversity Risk Filter. Local water stress and biodiversity pressure values must be collected by the preparers by following Appendix C and can be aided by the tool in Appendix E. The World Bank classifications for region and income class are also included.

D2. Where national value factors for a particular country are missing, an aggregate value, represented as the average value of other countries within the same region and income class, is used. In Table D1, aggregated values are noted with an asterisk (\*) and replaced outliers are noted with a dagger symbol (†). Regional and Income averages are provided separately in Table D2. All values are rounded to the nearest penny (\$0.01).

D3. Value factors will be updated regularly considering: (1) adjustments for inflation, (2) updated impact functions that more fully represent the impacts of water consumption, (3) updated estimation of future damages as they are closer to present day, and (4) advancements in water consumption research that align with principles and concepts laid out in the General Methodology.

$$\sum (WC_{site} * VF_{H_2O-site}) \text{ for all locations} = \text{H}_2\text{O Value}_{\text{Total}} \quad (\text{Eq. 1})$$

$$VF_{H_2O-site} = VF_{\text{access-site}} + \text{MAX}(VF_{\text{es-site}}, VF_{\text{nutrition-site}}, VF_{\text{disease-site}}) \quad (\text{Eq. 2})$$

$$VF_{\text{es-site}} = VF_{\text{es}} * \frac{BD_{\text{local}}}{BD_{\text{national}}} \quad (\text{Eq. 3})$$

$$VF_{\text{nutrition-site}} = VF_{\text{nutrition}} * \frac{WS_{\text{local}}}{WS_{\text{national}}} \quad (\text{Eq. 4})$$

$$VF_{\text{disease-site}} = VF_{\text{disease}} * \frac{WS_{\text{local}}}{WS_{\text{national}}} \quad (\text{Eq. 5})$$

<sup>134</sup>Local, global, and utility weighted perspectives can be found within the Water Consumption Valuation Tool in Appendix E.

<sup>135</sup>For aid in calculating the preferred option, refer to the Water Consumption Valuation Tool in Appendix E.

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2</sub> O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Afghanistan	South Asia	Low income	\$0.62	\$0.30	\$0.04	\$16.07	2.36	3.37	\$16.69
Albania	Europe & Central Asia	Upper middle income	\$2.45	\$0.01	\$0.07	\$4.21	2.79	3.47	\$6.66
Algeria	Middle East & North Africa	Lower middle income	\$0.24	\$0.14	\$0.00	\$9.83	2.23	3.87	\$10.08
American Samoa	East Asia & Pacific	High income	\$2.42	\$0*	\$0.04*	\$0.07*	3.14	1.46	\$2.49
Andorra	Europe & Central Asia	High income	\$1.99	\$0*	\$0.00	\$2.81	2.89	3.54	\$4.80
Angola	Sub-Saharan Africa	Lower middle income	\$1.32	\$0.02	\$0.00	\$3.64	2.32	1.13	\$4.96
Antigua and Barbuda	Latin America & Caribbean	High income	\$1.74	\$0.01*	\$0.45	\$0.00	2.25	2.44	\$1.74
Argentina	Latin America & Caribbean	Upper middle income	\$1.09	\$0.01	\$0.00	\$2.77	2.89	1.83	\$3.86
Armenia	Europe & Central Asia	Upper middle income	\$1.91	\$0.12	\$0.00	\$0.42	3.22	2.99	\$2.33
Aruba	Latin America & Caribbean	High income	\$0.73	\$0.01*	\$0.29*	\$0.79*	1.62	2.44	\$1.52
Australia	East Asia & Pacific	High income	\$0.72	\$0.00	\$0.04*	\$0.57	2.77	2.91	\$1.29
Austria	Europe & Central Asia	High income	\$2.65	\$0.00	\$0.00	\$0.00	3.08	0.26	\$2.65
Azerbaijan	Europe & Central Asia	Upper middle income	\$3.77	\$0.12	\$0.00	\$4.70	3.07	2.47	\$8.46
Bahamas, The	Latin America & Caribbean	High income	\$2.22	\$0.01*	\$0.00	\$0.00	2.90	2.44	\$2.22
Bahrain	Middle East & North Africa	High income	\$0.20	\$0.04*	\$0*	\$51.08	2.13	5.00	\$51.28
Bangladesh	South Asia	Lower middle income	\$2.63	\$0.40	\$0.00	\$8.94	3.19	2.66	\$11.57
Barbados	Latin America & Caribbean	High income	\$2.17	\$0.01*	\$0.01	\$0.00	3.04	2.44	\$2.17
Belarus	Europe & Central Asia	Upper middle income	\$2.79	\$0.00	\$0.00	\$0.00	3.37	1.18	\$2.79
Belgium	Europe & Central Asia	High income	\$2.44	\$0.00	\$0.00	\$12.01	3.56	4.41	\$14.45
Belize	Latin America & Caribbean	Upper middle income	\$1.71	\$0.00	\$0.00	\$0.00	3.75	0.07	\$1.71
Benin	Sub-Saharan Africa	Lower middle income	\$1.10	\$0.01	\$0.00	\$0.01	3.36	0.00	\$1.11
Bermuda	North America	High income	\$2.24	\$0*	\$0.01*	\$2.66*	3.32	1.92	\$4.90
Bhutan	South Asia	Lower middle income	\$2.42	\$0.01	\$0.11	\$0.14	2.19	0.37	\$2.56

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH2O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Bosnia and Herzegovina	Europe & Central Asia	Upper middle income	\$2.83	\$0.00	\$0.00	\$0.00	2.51	0.40	\$2.83
Botswana	Sub-Saharan Africa	Upper middle income	\$0.77	\$0.21	\$0.00	\$4.85	1.94	4.66	\$5.62
Brazil	Latin America & Caribbean	Upper middle income	\$1.48	\$0.00	\$0.00	\$0.01	3.25	1.04	\$1.49
British Virgin Islands	Latin America & Caribbean	High income	\$2.01	\$0.01*	\$0.29*	\$0.00	2.25	2.44	\$2.01
Brunei Darussalam	East Asia & Pacific	High income	\$1.66	\$0.00	\$0.00	\$0.00	3.22	-	\$1.66
Bulgaria	Europe & Central Asia	Upper middle income	\$2.75	\$0.02	\$0.01*	\$0.01	3.30	1.46	\$2.76
Burkina Faso	Sub-Saharan Africa	Low income	\$1.57	\$0.01	\$0.00	\$2.22	3.06	1.65	\$3.79
Burundi	Sub-Saharan Africa	Low income	\$1.41	\$0.01	\$0.10	\$0.00	2.90	-	\$1.41
Cabo Verde	Sub-Saharan Africa	Lower middle income	\$1.14	\$0.05*	\$0.00	\$1.06*	2.88	1.02	\$2.20
Cambodia	East Asia & Pacific	Lower middle income	\$1.99	\$0.01	\$0.17	\$0.17	3.52	1.87	\$2.16
Cameroon	Sub-Saharan Africa	Lower middle income	\$1.56	\$0.00	\$1.10	\$0.00	3.03	0.01	\$1.56
Canada	North America	High income	\$1.72	\$0.00	\$0.01	\$0.43	3.03	1.23	\$2.14
Cayman Islands	Latin America & Caribbean	High income	\$1.96	\$0.01*	\$0.29*	\$0.00	2.07	2.44	\$1.96
Central African Republic	Sub-Saharan Africa	Low income	\$1.48	\$0.00	\$0.23	\$0.00	2.04	0.01	\$1.48
Chad	Sub-Saharan Africa	Low income	\$0.63	\$0.02	\$0.35	\$1.40	1.79	0.85	\$2.03
Channel Islands	Europe & Central Asia	High income	\$2.24*	\$0*	\$0.13*	\$3.28*	2.99	1.81	\$5.52
Chile	Latin America & Caribbean	High income	\$1.48	\$0.03	\$1.06	\$11.02	2.89	4.47	\$12.50
China	East Asia & Pacific	Upper middle income	\$1.46	\$0.06	\$0.00	\$7.24	3.20	2.80	\$8.71
Colombia	Latin America & Caribbean	Upper middle income	\$1.50	\$0.00	\$0.00	\$0.00	2.68	0.50	\$1.51
Comoros	Sub-Saharan Africa	Lower middle income	\$1.86	\$0.05*	\$0.00	\$0.01	2.50	1.02	\$1.87
Congo, Dem. Rep.	Sub-Saharan Africa	Low income	\$1.66	\$0.00	\$0.00	\$0.46	2.86	0.01	\$2.13
Congo, Rep.	Sub-Saharan Africa	Lower middle income	\$1.47	\$0.00	\$0.03	\$0.00	2.46	0.01	\$1.47
Costa Rica	Latin America & Caribbean	Upper middle income	\$1.74	\$0.00	\$0*	\$0.00	3.35	0.65	\$1.74

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2</sub> O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Croatia	Europe & Central Asia	High income	\$2.74	\$0.00	\$0.00	\$0.00	2.90	0.17	\$2.74
Cuba	Latin America & Caribbean	Upper middle income	\$2.05	\$0.02	\$0.00	\$0.00	2.62	1.65	\$2.05
Curacao	Latin America & Caribbean	High income	\$1.71*	\$0.01*	\$0.29*	\$0.79*	1.62	2.44	\$2.50
Cyprus	Europe & Central Asia	High income	\$1.76	\$0.00	\$0.00	\$35.89	2.87	5.00	\$37.66
Czechia	Europe & Central Asia	High income	\$2.72	\$0.00	\$0.00	\$0.00	3.28	1.84	\$2.72
Denmark	Europe & Central Asia	High income	\$2.71	\$0.00	\$0.25	\$0.00	2.52	0.95	\$2.71
Djibouti	Middle East & North Africa	Lower middle income	\$0.27	\$0.04	\$0.00	\$0.00	1.90	3.18	\$0.27
Dominica	Latin America & Caribbean	Upper middle income	\$1.68	\$0.02*	\$0.00	\$0.00	2.88	1.39	\$1.68
Dominican Republic	Latin America & Caribbean	Upper middle income	\$1.70	\$0.02	\$0*	\$0.00	3.67	1.60	\$1.70
Ecuador	Latin America & Caribbean	Upper middle income	\$1.55	\$0.04	\$0.00	\$0.00	3.38	0.66	\$1.55
Egypt, Arab Rep.	Middle East & North Africa	Lower middle income	\$0.30	\$0.33	\$0.00	\$19.90	2.46	4.85	\$20.23
El Salvador	Latin America & Caribbean	Upper middle income	\$1.74	\$0.00	\$0.00	\$0.16	3.07	1.95	\$1.90
Equatorial Guinea	Sub-Saharan Africa	Upper middle income	\$1.67	\$0.00	\$0.00	\$0.00	2.49	-	\$1.67
Eritrea	Sub-Saharan Africa	Low income	\$0.45	\$0.10	\$0.00	\$24.40	1.86	3.94	\$24.84
Estonia	Europe & Central Asia	High income	\$2.96	\$0.00	\$3.48	\$0.00	2.91	1.22	\$3.48
eSwatini	Sub-Saharan Africa	Lower middle income	\$1.55	\$0.03	\$0.00	\$0.00	3.32	0.31	\$1.55
Ethiopia	Sub-Saharan Africa	Low income	\$0.99	\$0.14	\$0.00	\$1.04	2.45	0.96	\$2.03
Faroe Islands	Europe & Central Asia	High income	\$1.67	\$0*	\$0.13*	\$0.00	1.17	1.81	\$1.67
Fiji	East Asia & Pacific	Upper middle income	\$1.85	\$0.00	\$0.67	\$0.00	3.23	2.53	\$1.85
Finland	Europe & Central Asia	High income	\$2.97	\$0.00	\$0.01	\$0.00	2.67	0.81	\$2.97
France	Europe & Central Asia	High income	\$2.58	\$0.00	\$0.00	\$0.72	3.49	1.92	\$3.30
French Polynesia	East Asia & Pacific	High income	\$2.07	\$0*	\$0.04*	\$0.07*	3.14	1.46	\$2.14

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2</sub> O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Gambia, The	Sub-Saharan Africa	Low income	\$2.07	\$0.01	\$0.00	\$0.00	2.62	0.02	\$2.07
Georgia	Europe & Central Asia	Upper middle income	\$2.42	\$0.09	\$0.11	\$0.00	2.44	0.93	\$2.42
Germany	Europe & Central Asia	High income	\$2.63	\$0.00	\$0.00	\$0.00	3.15	2.04	\$2.63
Ghana	Sub-Saharan Africa	Lower middle income	\$1.28	\$0.02	\$0.00	\$0.02	3.66	0.11	\$1.29
Gibraltar	Europe & Central Asia	High income	\$1.97	\$0*	\$0.13*	\$3.28*	4.00	1.81	\$5.25
Greece	Europe & Central Asia	High income	\$2.17	\$0.01	\$0.01	\$14.95	2.71	4.34	\$17.12
Greenland	Europe & Central Asia	High income	\$0.50	\$0*	\$0.13*	\$0.00	1.47	1.81	\$0.50
Grenada	Latin America & Caribbean	Upper middle income	\$1.74	\$0.02*	\$0.00	\$0.00	3.04	1.39	\$1.74
Guam	East Asia & Pacific	High income	\$2.11	\$0*	\$0.04*	\$0.07*	3.25	1.46	\$2.18
Guatemala	Latin America & Caribbean	Upper middle income	\$1.64	\$0.00	\$0*	\$0.02	3.77	1.03	\$1.66
Guinea	Sub-Saharan Africa	Lower middle income	\$1.18	\$0.01	\$0.00	\$0.00	3.21	0.36	\$1.18
Guinea-Bissau	Sub-Saharan Africa	Low income	\$1.55	\$0.01	\$0.01	\$0.00	3.20	0.31	\$1.55
Guyana	Latin America & Caribbean	High income	\$1.62	\$0.00	\$0.02	\$0.00	2.18	2.70	\$1.62
Haiti	Latin America & Caribbean	Lower middle income	\$1.99	\$0.04	\$0.00	\$0.00	3.42	1.60	\$1.99
Honduras	Latin America & Caribbean	Lower middle income	\$1.69	\$0.00	\$0.08	\$0.00	3.27	0.11	\$1.69
Hong Kong SAR, China	East Asia & Pacific	High income	\$1.86	\$0*	\$0.04*	\$0.00	3.14	1.46	\$1.86
Hungary	Europe & Central Asia	High income	\$2.73	\$0.00	\$0.00	\$0.00	3.27	0.43	\$2.73
Iceland	Europe & Central Asia	High income	\$0.87	\$0.00	\$0.00	\$0.00	1.30	-	\$0.87
India	South Asia	Lower middle income	\$2.31	\$0.42	\$0.00	\$14.98	3.74	4.11	\$17.29
Indonesia	East Asia & Pacific	Upper middle income	\$1.75	\$0.04	\$0.00	\$0.18	3.76	2.67	\$1.93
Iran, Islamic Rep.	Middle East & North Africa	Lower middle income	\$0.68	\$0.13	\$0.00	\$27.68	2.50	4.65	\$28.35
Iraq	Middle East & North Africa	Upper middle income	\$0.46	\$0.20	\$0.00	\$25.82	2.74	4.15	\$26.28

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH2O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Isle of Man	Europe & Central Asia	High income	\$1.53	\$0*	\$0.13*	\$0.00	1.50	1.81	\$1.53
Israel	Middle East & North Africa	High income	\$1.07	\$0.02	\$0.00	\$40.50	3.12	4.94	\$41.57
Italy	Europe & Central Asia	High income	\$2.48	\$0.00	\$0.00	\$12.05	3.69	3.34	\$14.54
Jamaica	Latin America & Caribbean	Upper middle income	\$1.67	\$0.00	\$0.00	\$0.00	3.62	-	\$1.67
Japan	East Asia & Pacific	High income	\$2.97	\$0.00	\$0.00	\$0.00	3.59	1.97	\$2.97
Jordan	Middle East & North Africa	Lower middle income	\$0.28	\$0.08	\$0.00	\$44.94	2.39	4.62	\$45.22
Kazakhstan	Europe & Central Asia	Upper middle income	\$1.38	\$0.05	\$0.00	\$4.55	1.80	2.51	\$5.92
Kenya	Sub-Saharan Africa	Lower middle income	\$0.87	\$0.01	\$0.00	\$0.09	2.59	0.79	\$0.95
Kiribati	East Asia & Pacific	Lower middle income	\$4.85	\$0.02*	\$0.00	\$0.21*	1.88	1.72	\$5.07
Korea, Dem. People's Rep.	East Asia & Pacific	Low income	\$2.85	\$0.12	\$0.00	\$0.00	2.66	2.32	\$2.85
Korea, Rep.	East Asia & Pacific	High income	\$2.89	\$0.00	\$0.00	\$0.00	3.11	2.38	\$2.89
Kosovo	Europe & Central Asia	Upper middle income	\$2.39*	\$0.05*	\$0.01*	\$2.92	2.81	1.99	\$5.31
Kuwait	Middle East & North Africa	High income	\$0.18	\$0.00	\$0*	\$44.08	2.08	5.00	\$44.26
Kyrgyz Republic	Europe & Central Asia	Lower middle income	\$1.20	\$0.15	\$0.95*	\$2.20	2.40	3.28	\$3.41
Lao PDR	East Asia & Pacific	Lower middle income	\$1.68	\$0.00	\$0.00	\$0.00	3.63	0.74	\$1.68
Latvia	Europe & Central Asia	High income	\$2.79	\$0.00	\$0.00	\$0.00	3.26	0.57	\$2.79
Lebanon	Middle East & North Africa	Lower middle income	\$1.10	\$0.10	\$0.00	\$35.45	3.14	5.00	\$36.55
Lesotho	Sub-Saharan Africa	Lower middle income	\$0.92	\$0.30	\$0.00	\$0.00	2.71	2.95	\$0.92
Liberia	Sub-Saharan Africa	Low income	\$1.66	\$0.01	\$0.01	\$0.00	3.22	-	\$1.66
Libya	Middle East & North Africa	Upper middle income	\$0.19	\$0.09	\$0.20	\$17.09	1.55	4.81	\$17.29
Liechtenstein	Europe & Central Asia	High income	\$2.48	\$0*	\$0.13*	\$0.00	2.88	0.81	\$2.48
Lithuania	Europe & Central Asia	High income	\$2.72	\$0.00	\$0.00	\$0.00	3.72	2.14	\$2.72
Luxembourg	Europe & Central Asia	High income	\$2.54	\$0.00	\$0.00	\$0.00	3.64	2.93	\$2.54

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2</sub> O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Madagascar	Sub-Saharan Africa	Low income	\$1.12	\$0.02	\$0.00	\$0.33	2.81	0.90	\$1.46
Malawi	Sub-Saharan Africa	Low income	\$1.96	\$0.01	\$0.01	\$0.02	2.90	0.75	\$1.98
Malaysia	East Asia & Pacific	Upper middle income	\$1.72	\$0.00	\$0.02	\$0.00	3.67	1.03	\$1.72
Maldives	South Asia	Upper middle income	\$5.73	\$0.32*	\$0.00	\$8.08*	2.89	2.83	\$13.81
Mali	Sub-Saharan Africa	Low income	\$0.63	\$0.29	\$0.01	\$7.71	2.06	0.68	\$8.34
Malta	Middle East & North Africa	High income	\$1.47	\$0.04*	\$0.00	\$23.18	3.33	4.99	\$24.65
Marshall Islands	East Asia & Pacific	Upper middle income	\$5.73	\$0.03*	\$0.00	\$2.09*	1.88	2.53	\$7.82
Mauritania	Sub-Saharan Africa	Lower middle income	\$0.28	\$0.01	\$0.07*	\$7.76	1.61	2.73	\$8.04
Mauritius	Sub-Saharan Africa	Upper middle income	\$1.86	\$0.09*	\$0.00	\$4.39*	2.34	2.60	\$6.26
Mexico	Latin America & Caribbean	Upper middle income	\$1.01	\$0.03	\$0.00	\$15.49	3.19	4.00	\$16.50
Micronesia, Fed. Sts.	East Asia & Pacific	Lower middle income	\$1.88	\$0.02*	\$0.00	\$0.21*	2.25	1.72	\$2.09
Moldova	Europe & Central Asia	Upper middle income	\$2.68	\$0.01	\$0.00	\$0.00	3.09	1.26	\$2.68
Monaco	Europe & Central Asia	High income	\$0.58	\$0*	\$0.13*	\$3.28*	3.75	1.81	\$3.87
Mongolia	East Asia & Pacific	Lower middle income	\$0.84	\$0.00	\$0.00	\$1.22	1.52	3.13	\$2.06
Montenegro	Europe & Central Asia	Upper middle income	\$2.73	\$0.00	\$0.01	\$0.00	2.93	0.72	\$2.73
Morocco	Middle East & North Africa	Lower middle income	\$0.71	\$0.37	\$0.00	\$11.06	2.64	3.99	\$11.76
Mozambique	Sub-Saharan Africa	Low income	\$1.19	\$0.09	\$0.00	\$0.22	2.67	0.37	\$1.41
Myanmar	East Asia & Pacific	Lower middle income	\$1.91	\$0.00	\$0.33	\$0.39	3.25	2.13	\$2.30
Namibia	Sub-Saharan Africa	Upper middle income	\$0.43	\$0.01	\$0.06	\$2.03	1.94	4.18	\$2.45
Nauru	East Asia & Pacific	High income	\$2.53	\$0*	\$0.00	\$0.07*	1.88	1.46	\$2.60
Nepal	South Asia	Lower middle income	\$1.93	\$0.54	\$0.02*	\$3.98	2.64	3.18	\$5.91
Netherlands	Europe & Central Asia	High income	\$2.28	\$0.00	\$0.01	\$0.59	3.32	1.58	\$2.87
New Caledonia	East Asia & Pacific	High income	\$1.72	\$0*	\$0.04*	\$0.00	2.48	1.46	\$1.72

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2O</sub> <sup>national</sup>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sup>National</sup>	WS <sup>National</sup>	
Nicaragua	Latin America & Caribbean	Lower middle income	\$2.03	\$0.01	\$0.00	\$0.00	3.03	0.21	\$2.03
Niger	Sub-Saharan Africa	Low income	\$0.40	\$0.12	\$0.00	\$21.04	1.76	3.47	\$21.44
Nigeria	Sub-Saharan Africa	Lower middle income	\$1.66	\$0.22	\$0.11	\$1.65	3.26	0.80	\$3.32
North Macedonia	Europe & Central Asia	Upper middle income	\$2.61	\$0.04	\$0.00	\$0.00	2.84	3.01	\$2.62
Northern Mariana Islands	East Asia & Pacific	High income	\$2.50	\$0*	\$0.04*	\$0.07*	3.25	1.46	\$2.57
Norway	Europe & Central Asia	High income	\$1.58	\$0.00	\$0.13*	\$0.00	2.19	0.19	\$1.58
Oman	Middle East & North Africa	High income	\$0.18	\$0.07	\$0.00	\$51.09	1.80	5.00	\$51.27
Pakistan	South Asia	Lower middle income	\$0.98	\$0.41	\$0.00	\$12.46	2.99	3.79	\$13.44
Palau	East Asia & Pacific	Upper middle income	\$1.99	\$0.03*	\$0.00	\$2.09*	2.25	2.53	\$4.08
Panama	Latin America & Caribbean	High income	\$1.73	\$0.00	\$0.29*	\$0.00	2.91	0.75	\$1.73
Papua New Guinea	East Asia & Pacific	Lower middle income	\$1.69	\$0.00	\$0.00	\$0.00	3.18	-	\$1.69
Paraguay	Latin America & Caribbean	Upper middle income	\$1.55	\$0.00	\$0.02	\$0.00	3.07	0.00	\$1.55
Peru	Latin America & Caribbean	Upper middle income	\$1.28	\$0.12	\$0.00	\$3.19	2.87	3.74	\$4.47
Philippines	East Asia & Pacific	Lower middle income	\$2.03	\$0.03	\$0.00	\$0.15	3.22	2.03	\$2.19
Poland	Europe & Central Asia	High income	\$2.73	\$0.00	\$0.00	\$0.05	3.34	1.66	\$2.78
Portugal	Europe & Central Asia	High income	\$1.96	\$0.00	\$0.00	\$7.14	3.44	3.26	\$9.10
Puerto Rico	Latin America & Caribbean	High income	\$1.59	\$0.00	\$0.29*	\$0.00	3.22	2.44	\$1.59
Qatar	Middle East & North Africa	High income	\$0.19	\$0.02	\$0.00	\$51.08	1.58	5.00	\$51.28
Romania	Europe & Central Asia	High income	\$2.78	\$0.00	\$0.00	\$0.00	3.11	1.19	\$2.78
Russian Federation	Europe & Central Asia	Upper middle income	\$1.86	\$0.01	\$0.00	\$0.04	2.70	1.17	\$1.89
Rwanda	Sub-Saharan Africa	Low income	\$1.58	\$0.01	\$0.00	\$0.00	3.49	-	\$1.58

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH2O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
San Marino	Europe & Central Asia	High income	\$2.42	\$0*	\$0.13*	\$12.66	3.87	4.45	\$15.08
Sao Tome and Principe	Sub-Saharan Africa	Lower middle income	\$1.96	\$0.05*	\$0.00	\$0.00	2.87	1.02	\$1.96
Saudi Arabia	Middle East & North Africa	High income	\$0.18	\$0.10	\$0*	\$46.88	2.20	4.98	\$47.06
Senegal	Sub-Saharan Africa	Lower middle income	\$1.55	\$0.01	\$0.00	\$3.03	2.65	2.22	\$4.58
Serbia	Europe & Central Asia	Upper middle income	\$2.75	\$0.00	\$0.01	\$1.03	2.66	1.24	\$3.78
Seychelles	Sub-Saharan Africa	High income	\$2.90	\$0.05*	\$0.00	\$2.45*	1.90	1.12	\$5.35
Sierra Leone	Sub-Saharan Africa	Low income	\$1.65	\$0.02	\$0.04*	\$0.00	3.34	-	\$1.65
Singapore	East Asia & Pacific	High income	\$1.07	\$0*	\$0.23	\$0.00	4.12	1.46	\$1.07
Sint Maarten (Dutch part)	Latin America & Caribbean	High income	\$1.71*	\$0.01*	\$0.29*	\$0.79*	2.43	2.44	\$2.50
Slovak Republic	Europe & Central Asia	High income	\$2.84	\$0.00	\$0.00	\$0.00	3.14	1.62	\$2.84
Slovenia	Europe & Central Asia	High income	\$2.92	\$0.00	\$0.00	\$0.00	3.09	0.53	\$2.92
Solomon Islands	East Asia & Pacific	Lower middle income	\$1.85	\$0.02*	\$0.00	\$0.00	3.18	1.72	\$1.85
Somalia	Sub-Saharan Africa	Low income	\$0.37	\$0.16	\$0.04*	\$3.21	1.38	1.67	\$3.58
South Africa	Sub-Saharan Africa	Upper middle income	\$0.78	\$0.22	27.07 †	\$15.09	3.18	4.17	\$43.27
South Sudan	Sub-Saharan Africa	Low income	\$1.05	\$0.05*	\$0.01	\$0.00	1.88	1.39	\$1.05
Spain	Europe & Central Asia	High income	\$1.98	\$0.00	\$0.00	\$15.40	3.48	3.94	\$17.38
Sri Lanka	South Asia	Lower middle income	\$1.62	\$0.18	\$0.00	\$0.00	3.14	2.36	\$1.62
St. Kitts and Nevis	Latin America & Caribbean	High income	\$1.71	\$0.01*	\$0.50	\$0.00	2.04	2.44	\$1.71
St. Lucia	Latin America & Caribbean	Upper middle income	\$1.68	\$0.02*	\$0*	\$0.00	3.04	1.39	\$1.68
St. Martin (French part)	Latin America & Caribbean	High income	\$1.71*	\$0.01*	\$0.29*	\$0.79*	2.43	2.44	\$2.50
St. Vincent and the Grenadines	Latin America & Caribbean	Upper middle income	\$1.78	\$0.02*	\$0*	\$0.00	3.04	1.39	\$1.78
Sudan	Sub-Saharan Africa	Low income	\$0.62	\$0.09	\$0.01	\$7.18	2.40	1.46	\$7.79

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH2O <sub>national</sub>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sub>National</sub>	WS <sub>National</sub>	
Sweden	Europe & Central Asia	High income	\$2.76	\$0.00	\$0.00	\$0.60	2.67	0.78	\$3.36
Switzerland	Europe & Central Asia	High income	\$2.24	\$0.00	\$0.00	\$0.00	3.12	0.41	\$2.24
Syrian Arab Republic	Middle East & North Africa	Low income	\$0.74	\$0.18	\$0.00	\$26.79	2.56	4.01	\$27.53
Taiwan	East Asia & Pacific	High income	\$1.88	\$0*	\$0.04*	\$0.11	3.14	1.46	\$1.99
Tajikistan	Europe & Central Asia	Lower middle income	\$0.89	\$0.24	\$0.00	\$4.38	2.42	2.34	\$5.27
Tanzania	Sub-Saharan Africa	Lower middle income	\$1.41	\$0.01	\$0.00	\$0.66	3.05	1.91	\$2.07
Thailand	East Asia & Pacific	Upper middle income	\$2.21	\$0.03	\$0.00	\$3.01	3.45	3.62	\$5.22
Timor-Leste	East Asia & Pacific	Lower middle income	\$1.65	\$0.02*	\$0.00	\$0.00	2.66	1.77	\$1.65
Togo	Sub-Saharan Africa	Low income	\$0.96	\$0.01	\$0.04*	\$0.00	3.50	0.00	\$0.96
Tonga	East Asia & Pacific	Upper middle income	\$2.41	\$0.03*	\$0.03	\$2.09*	3.01	2.53	\$4.49
Trinidad and Tobago	Latin America & Caribbean	High income	\$1.62	\$0.02	\$0.29*	\$0.00	3.17	2.44	\$1.62
Tunisia	Middle East & North Africa	Lower middle income	\$0.60	\$0.17	\$0.00	\$20.26	2.60	4.28	\$20.86
Turkiye	Europe & Central Asia	Upper middle income	\$1.67	\$0.10	\$0.00	\$7.13	2.98	3.39	\$8.80
Turkmenistan	Europe & Central Asia	Upper middle income	\$1.24	\$0.17	\$0.00	\$17.24	2.47	3.74	\$18.48
Turks and Caicos Islands	Latin America & Caribbean	High income	\$2.10	\$0.01*	\$0.29*	\$0.00	1.25	2.44	\$2.10
Tuvalu	East Asia & Pacific	Upper middle income	\$5.00	\$0.03*	\$0.00	\$2.09*	2.63	2.53	\$7.08
Uganda	Sub-Saharan Africa	Low income	\$1.91	\$0.01	\$0.04*	\$0.00	2.90	0.20	\$1.91
Ukraine	Europe & Central Asia	Lower middle income	\$2.73	\$0.03	\$2.84	\$0.91	2.97	1.37	\$3.75
United Arab Emirates	Middle East & North Africa	High income	\$0.18	\$0.04	\$0.00	\$50.61	1.97	5.00	\$50.79
United Kingdom	Europe & Central Asia	High income	\$1.76	\$0.00	\$0.00	\$0.00	3.44	1.30	\$1.76
United States	North America	High income	\$1.80	\$0.00	\$0.01	\$4.89	3.61	2.60	\$6.69
Uruguay	Latin America & Caribbean	High income	\$1.30	\$0.00	\$0.00	\$0.00	3.23	1.83	\$1.30
Uzbekistan	Europe & Central Asia	Lower middle income	\$0.92	\$0.20	\$0.00	\$16.67	2.26	3.63	\$17.59

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Country	Region	Income Class	Value factors (USD (2024) per m <sup>3</sup> )				Biodiversity and water stress		VFH <sub>2O</sub> <sup>national</sup>
			VF <sub>es</sub>	VF <sub>nutrition</sub>	VF <sub>disease</sub>	VF <sub>access</sub>	BD <sup>National</sup>	WS <sup>National</sup>	
Venezuela, RB	Latin America & Caribbean	Upper middle income	\$1.48	\$0.02	\$0*	\$0.05	2.51	1.82	\$1.52
Viet Nam	East Asia & Pacific	Lower middle income	\$1.91	\$0.07	\$0.00	\$0.20	3.68	2.11	\$2.10
Virgin Islands (U.S.)	Latin America & Caribbean	High income	\$1.73	\$0.01*	\$0.29*	\$0.00	2.25	2.44	\$1.73
West Bank and Gaza	Middle East & North Africa	Upper middle income	\$1.40	\$0.04	\$0.1*	\$38.85	3.17	4.48	\$40.25
Yemen, Rep.	Middle East & North Africa	Low income	\$0.19	\$0.48	\$0.00	\$28.58	1.97	4.69	\$29.06
Zambia	Sub-Saharan Africa	Lower middle income	\$1.28	\$0.01	\$0.00	\$1.85	2.94	0.85	\$3.13
Zimbabwe	Sub-Saharan Africa	Lower middle income		\$0.07	\$0.00	\$0.44	2.81	2.17	\$1.39

Table D1. Country value factors

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

D4. Values from Table D2 are used when the country of water consumption has no data available in Table D1. This table presents averages for region, income class, and region/income class cohorts, defined by the World Bank.<sup>136</sup> These values should not be used to replace national value factors that are available in Table D1. All presented values are from the global perspective. All values are rounded to the nearest penny (\$0.01).

Region	Income Class	VFes	VFnutrition	VFdisease	VFaccess
East Asia & Pacific		\$2.16	\$0.02	\$0.05	\$0.51
Europe & Central Asia		\$2.22	\$0.03	\$0.15	\$3.30
Latin America & Caribbean		\$1.65	\$0.02	\$0.09	\$0.86
Middle East & North Africa		\$0.51	\$0.14	\$0.01	\$31.65
North America		\$1.92	\$0.00	\$0.01	\$2.66
South Asia		\$2.28	\$0.32	\$0.02	\$8.08
Sub-Saharan Africa		\$1.28	\$0.05	\$3.98	\$2.45
	High income	\$1.89	\$0.01	\$0.12	\$7.11
	Upper middle income	\$1.98	\$0.04	\$3.70	\$3.63
	Lower middle income	\$1.47	\$0.11	\$0.10	\$5.10
	Low income	\$1.20	\$0.09	\$0.03	\$5.41
East Asia & Pacific	High income	\$1.93	\$0.00	\$0.04	\$0.07
East Asia & Pacific	Upper middle income	\$2.68	\$0.03	\$0.08	\$2.09
East Asia & Pacific	Lower middle income	\$2.00	\$0.02	\$0.04	\$0.21
East Asia & Pacific	Low income	\$2.85	\$0.12	\$0.00	\$0.00
Europe & Central Asia	High income	\$2.24	\$0.00	\$0.13	\$3.28
Europe & Central Asia	Upper middle income	\$2.39	\$0.05	\$0.01	\$2.64
Europe & Central Asia	Lower middle income	\$1.44	\$0.16	\$0.95	\$6.04
Europe & Central Asia	Low income	No value	No value	No value	No value
Latin America & Caribbean	High income	\$1.71	\$0.01	\$0.29	\$0.79
Latin America & Caribbean	Upper middle income	\$1.59	\$0.02	\$0.00	\$1.08
Latin America & Caribbean	Lower middle income	\$1.75	\$0.03	\$0.03	\$0.00
Latin America & Caribbean	Low income	No value	No value	No value	No value
Middle East & North Africa	High income	\$0.46	\$0.04	\$0.00	\$44.81
Middle East & North Africa	Upper middle income	\$0.68	\$0.11	\$0.10	\$27.25
Middle East & North Africa	Lower middle income	\$0.52	\$0.17	\$0.00	\$21.14
Middle East & North Africa	Low income	\$0.47	\$0.33	\$0.00	\$27.68
North America	High income	\$1.92	\$0.00	\$0.01	\$2.66
North America	Upper middle income	No value	No value	No value	No value

## Appendix D: National Value Factors, Water Stress, and Biodiversity Pressure – Global Perspective

Region	Income Class	VFes	VFnutrition	VFdisease	VFaccess
North America	Lower middle income	No value	No value	No value	No value
North America	Low income	No value	No value	No value	No value
South Asia	High income	No value	No value	No value	No value
South Asia	Upper middle income	\$5.73	No value	\$0.00	No value
South Asia	Lower middle income	\$1.98	\$0.32	\$0.02	\$6.75
South Asia	Low income	\$0.62	\$0.30	\$0.04	\$16.07
Sub-Saharan Africa	High income	\$2.90	No value	\$0.00	No value
Sub-Saharan Africa	Upper middle income	\$1.19	\$0.09	\$28.18	\$4.39
Sub-Saharan Africa	Lower middle income	\$1.30	\$0.05	\$0.07	\$1.06
Sub-Saharan Africa	Low income	\$1.22	\$0.05	\$0.04	\$3.15

Table D2. Regional Value Factors

<sup>136</sup>The World Bank. (2025). The World by Income and Region.

# Appendix E: Water Consumption Value Factor Tool

# Appendix E: Water Consumption Value Factor Tool

E1. The Water Consumption Value Factor Tool can be used to aid preparers in determining value factors for each site of water consumption. In the tool, preparers enter water consumption related disclosures to determine value factors (VFH2O-site) and impacts. For each site of water consumption, the preparer enters the (1) country, (2) local pressure on biodiversity (BDlocal), (3) local water stress (WSlocal), (4) site water consumption (WCsite), and (5) valuation perspective of interest. The tool can provide results for both the preferred and minimum options.

Water Consumption Value Factor Tool available [here](#)

# Appendix F: Previous Year Value Factors

# Appendix F: Previous Year Value Factors

F1. To conduct water consumption impact analysis for past years, the Value Factors need to be adjusted for inflation. In the table below, country Value Factors for each category are provided, adjusted for inflation to the year in reference (e.g. the 2020 Value Factors is in 2020 U.S. Dollars).

Previous Year Value Factors available [here](#)

# Appendix G: Alignment with Reporting Standards

# Appendix G: Alignment with Reporting Standards

G1. The data inputs required to prepare water consumption impact accounts closely align with the disclosure requirements of the ESRS E3: Water and marine resources, ESRS E4: Biodiversity and ecosystems, GRI 303: Water and Effluents 2018, and GRI 304: Biodiversity 2016. The International Sustainability Standards Board has not yet developed standards related to water consumption. Appendix G describes the linkages between data needed for reporting standards and the Water Consumption methodology.

## G2. ESRS Alignment

### a. Water consumption – own operations

- i. In ESRS E3, Disclosure Requirement E3–4 paragraph 25 states “The undertaking shall disclose information on its water consumption performance related to its material impacts, risks and opportunities.”
- ii. The data needed for the Water Consumption Methodology fully aligns with the data required for E3–4 by focusing on water consumption in m<sup>3</sup> as the metric of interest.

### b. Water consumption – value chain

- i. In ESRS E3, paragraphs 2, 3, 7(a), and 11(c) state that understanding water consumption in the upstream and downstream value chain is important for assessing materiality, impacts, and policies. Therefore, ESRS E3 demonstrates the need for water-related impacts in the value chain.
- ii. The data needed for the Water Consumption Methodology expands upon this expectation, even though Disclosure E3–4 does not explicitly require reporting of value chain water consumption.

### c. Location of water consumption

- i. In ESRS E3, Disclosure Requirement E3–4 paragraph 27(b) states an entity shall report “total water consumption in m<sup>3</sup> in areas at material water risk, including areas of high-water stress”. To determine areas of material water risk requires some knowledge of the specific location of water consumption.
- ii. The data needed for the Water Consumption Methodology expands upon the data needed for Disclosure E3–4 by asking for the location

of all sites of water consumption.

### d. Water stress

- i. In ESRS E3, Disclosure Requirement E3–4 paragraph 27(b) states an entity shall report “total water consumption in m<sup>3</sup> in areas at material water risk, including areas of high-water stress”. This statement acknowledges that water stress is an important variable within the context of water consumption.
- ii. The data needed for the Water Consumption Methodology expands upon the data needed for Disclosure E3–4 by asking for a metric of water stress at each site of water consumption.

### e. Biodiversity pressure

- i. The interactions of water, ecosystems and biodiversity is acknowledged in both ESRS E3: Water and marine resources, ESRS E4: Biodiversity and ecosystems. In ESRS E4, paragraph 7 states “All Disclosure Requirements concerning material impacts related to biodiversity and ecosystems change arising from other ESRS are listed and referenced in this Standard, and in particular to: (b) ESRS E3 Water and marine resources. Further, Disclosure Requirement E4–5 asks for reporting “metrics related to its material impacts resulting in biodiversity and ecosystem change.”
- ii. The data needed for the Water Consumption Methodology expands upon the data required for E4–5 by asking for a consideration of the risks and pressures on biodiversity in the locations of operation.

## G3. GRI Alignment

### a. Water consumption – own operations

- i. In GRI 303, Disclosure Requirement 303–5 (a) states that the reporting organization shall report “Total water consumption from all areas in megaliters.”.
- ii. The data needed for the Water Consumption Methodology fully aligns with the data required for 303–5 by focusing on water consumption in m<sup>3</sup> as the metric of interest.

## Appendix G: Alignment with Reporting Standards

- b. Water consumption – value chain
  - i. In GRI 303, Disclosure 303-1 paragraph 1.2.1 recommends that an organization should report “an overview of water use across the organization’s value chain” while also acknowledging that an organization can affect water availability “through its value chain”. At this time, this is a recommendation and not a requirement.
  - ii. The data needed for the Water Consumption Methodology fully aligns with recommendation 1.2.1 and expands upon the requirements of 303-1 and 303-5.
- c. Location of water consumption
  - i. In GRI 303, Disclosure Requirement 303-5 (b) states that the reporting organization shall report “Total water consumption from all areas with water stress in megaliters.”. To determine areas of material water risk requires some knowledge of the specific location of water consumption.
  - ii. The data needed for the Water Consumption Methodology expands upon the data needed for Disclosure 303-5 by asking for the location of all sites of water consumption.
- d. Water stress
  - i. In GRI 303, Disclosure Requirement 303-5 (b) states that the reporting organization shall report “Total water consumption from all areas with water stress in megaliters.”. This statement acknowledges that water stress is an important variable within the context of water consumption.
  - ii. The data needed for the Water Consumption Methodology expands upon the data needed for Disclosure 303-5 by asking for a metric of water stress at each site of water consumption.
- e. Biodiversity pressure
  - i. The interactions of water, ecosystems and biodiversity is acknowledged in both GRI 303: Water and Effluents 2018 and GRI 304: Biodiversity 2016. In GRI 304, Disclosure 304-2 (a) requires reporting on the “Nature of significant direct and indirect impacts on biodiversity.” This Disclosure includes consideration of land use, change, invasive species, and pollution which are all considerations that go into the biodiversity pressure value in the Water Consumption Methodology.
  - ii. The data needed for the Water Consumption Methodology expands upon the data required for 304-2 by asking for a consideration of the risks and pressures on biodiversity in the locations of operation.

# Appendix H: Governance for Valuation Transparency Requirement Report: Value Factors

## Appendix H: Governance for Valuation Transparency Requirement Report: Value Factors

This Appendix presents the Water Consumption Topic Methodology summarized in the form of the Transparency Report proposed by the Governance for Valuation document (Table B).<sup>137</sup> Minor adaptations have been made to the report structure to align with the impact accounting methodology.

TRANSPARENCY REPORT –(IMPACT) VALUE FACTORS	
<p><b>Title and version #:</b> <i>Water Consumption Topic Methodology Value Factor, Version 2</i></p> <p><b>Developed by:</b> <i>International Foundation for Valuing Impacts, in partnership with Value Balancing Alliance</i></p> <p><b>Governance:</b> <i>Overseen by Valuation Technical &amp; Practitioner Committee (VTPC), 18 independent experts; approved via Due Process Protocol (public consultation + VTPC vote); IFVI Board provides oversight</i></p> <p><b>Name of impact driver:</b> <i>Water consumption</i></p> <p><b>Published and updated date:</b> <i>[to be added after approval]</i></p>	
VALUE FACTOR UNIT	
1. Unit	<p><b>1.1 Unit</b></p> <p>The impact in dollars per meter cubed (\$/m<sup>3</sup>) of water consumption to calculate the total impact from water consumption with distinct values used based on geography.</p> <p><b>1.2 Scaling</b></p> <ul style="list-style-type: none"> <li>Value factors vary by country and site to reflect local water scarcity conditions (physical and social).</li> <li>Derived from water depletion indices (e.g., WRI Aqueduct) and water stress levels.</li> <li>PPP-adjusted for comparability across geographies.</li> <li>Temporal scaling reflects annual consumption volume per reporting period.</li> </ul> <p><b>1.3 Geographical specificity</b></p> <ul style="list-style-type: none"> <li>Country- and site-level resolution. Factors use WRI Aqueduct, FAO, and World Bank datasets for water availability, withdrawals, and scarcity.</li> </ul> <p><b>1.4 Time period</b></p> <p>Per annual reporting period</p>
2. Linkages to other value factors	<p>This value factor is part of the public good, independent, impact accounting methodology being developed by IFVI, in partnership with VBA and can be combined or complemented with value factors from other topic methodologies. See <a href="https://ifvi.org/methodology/environmental-topic-methodology/interim-methodologies/#GlobalValueFactorDatabase">https://ifvi.org/methodology/environmental-topic-methodology/interim-methodologies/#GlobalValueFactorDatabase</a> for more information.</p>

<sup>137</sup>Capitals Coalition (2025b). Governance for Valuation – Part of the Integrated Decision-Making Framework. <https://capitalscoalition.org/capitals-approach/frameworkintegrated/>

## Appendix H: Governance for Valuation Transparency Requirement Report: Value Factors

SCOPE OF VALUE FACTOR	
3. Scope	<p><b>3.1 Impact pathway</b></p> <p>See Figure 2 in this document for an overview of the impact pathway and included impact end points. The scope of the value factor includes all water consumption along the entire value chain.</p> <p><b>3.2 Materiality assessment</b></p> <p><b>3.3</b> Application of the methodology by an entity is based on a materiality assessment as outlined by General Methodology 1: Conceptual Framework for Impact Accounting. Stakeholders affected</p> <p>Affected stakeholders were not directly consulted in developing the value factors. However, their perspectives are embedded indirectly through the research underlying the impact pathway and the valuation functions employed (e.g., willingness-to-pay studies). This approach based the impacts of water consumption on empirical evidence utilizing aggregated stakeholder responses and behaviors across many contexts, effectively capturing their preferences.</p> <p><b>3.4 Scope extent</b></p> <p>The value factor captures four impacts: affected health from malnutrition, affected health from water-borne disease, altered ecosystem services, and financial costs to access future water. Future work will continue to explore the valuation of additional impacts.</p> <p>More detail about the impact pathway scope can be found in 'Section 1.4: Scope and Assumptions.'</p>

# Appendix H: Governance for Valuation Transparency Requirement Report: Value Factors

ESTIMATING CHANGES IN CAPITALS AND IMPACTS	
<p><b>4. Approach and specificity – changes in capitals</b></p>	<p><b>4.1–4.2 Approach</b></p> <p>The changes in natural capital are translated into changes in well-being. Estimates include affected health via malnutrition, affected health via water-borne disease, altered ecosystem services, and financial costs to access future water.</p> <p>All approaches are considered nationally or sub-nationally, reflecting geographic variation and future projections of water availability leading to strong representation anywhere in the world.</p> <p>Present research has not yet captured all impacts on society in rigorous models and future work will continue to develop value factors for these impacts. Additional details about estimating changes in well-being can be found in ‘Section 4.2: Outcomes and Impacts’ and ‘Appendix B: Methodological Details.’</p> <p><b>4.3 Assumptions</b></p> <ul style="list-style-type: none"> <li>• LC-Impact used for water stress data and water use-related human health characterization factors.</li> <li>• Actual evapotranspiration rates from (USGS) FEWS NET Data Portal.</li> <li>• Water demand vs supply estimates from World Resources Institute’s Aqueduct Water Risk Atlas.</li> <li>• Additional details can be found in ‘Appendix B: Methodological Details.’</li> </ul> <p><b>4.4 Data gaps</b></p> <p>Gap filling was conducted at the country level using World Bank regional and income classifications. Where country-level data was not available for a given pathway, we applied a hierarchical approach to gap filling: (1) fill gaps using the average of countries in the same combined region-income cohort; (2) if no such average could be calculated, use the regional average; and (3) if the regional average was also unavailable, use the income-class average</p> <p><b>4.5 Data sources</b></p> <p><i>Affected health from malnutrition</i>– LC-Impact</p> <p><i>Affected health from water-borne diseases</i>– Motoshita et al. (2011)</p> <p><i>Ecosystem services</i>– Ecosystem Service Valuation Database, Brander et al. 2024, AET dataset from 2024 United States Geological Survey’s (USGS) FEWS NET Data Portal</p> <p><i>Financial costs future access</i>– World Resource Institute’s AQUEDUCT Water Risk Atlas.</p> <p>See Appendix B of this document for more information.</p>

## Appendix H: Governance for Valuation Transparency Requirement Report: Value Factors

ESTIMATING CHANGES IN CAPITALS AND IMPACTS	
<p>5. Approach and specificity – impacts</p>	<p><b>5.1 – 5.3 Approach</b></p> <p>For the two health related impacts, valuation is done using the value of statistical life (VSL) to convert DALYs to impacts.</p> <p>For altered ecosystem services, a wide array of valuation approaches are used in the ESVD database including market prices, damage costs, contingent valuation, and choice modelling, summary statistics by Brander et al. 2024.</p> <p>For financial costs to access future water, a replacement cost approach is used. These impacts are discounted to present-day values using a 2% discount rate.</p> <p>The value factors can be applied at spatial scales as precise as a watershed or city. This detailed representation of value leads to improved representation of localized impacts.</p> <p><b>5.4 Assumptions</b></p> <p>Malnutrition and affected health from water-borne diseases– Value of one year of life lost calculated at \$2,781,000 USD</p> <p>Ecosystem services– biome-level ES values, food provisioning services were excluded from the biome-level averages to avoid double-counting with the malnutrition impact, actual evapotranspiration (AET) was selected as a proxy for biome water requirements as it represents the amount of water transferred from Earth’s surface to the atmosphere through both soil evaporation and transpiration.</p> <p>Financial costs future access– a sustainable rate of extraction is defined as a Water Stress (WS) &lt; 1 and, therefore, any year or watershed where WS is &lt; 1, no shortage exists and no cost was applied. For WS values above 1, a proportion of the present water consumption is driving future shortage. Future generations will have to resolve this shortage, leading to financial costs. The proportion above the sustainable rate was considered as (WS-1) / (WS). This ratio is multiplied by a cost (the cost to supply water) to represent the increase in price of obtaining water in the future because of scarcity in supply.</p> <p><b>5.5 Data gaps</b></p> <p>See 4.4 above.</p> <p><b>5.6 Data sources</b></p> <p>Malnutrition– LC–Impact</p> <p>Affected health from water-borne diseases– Motoshita et al. (2011)</p> <p>Ecosystem services– Ecosystem Service Valuation Database, Brander et al. 2024, AET dataset from 2024 United States Geological Survey’s (USGS) FEWS NET Data Portal</p> <p>Financial costs future access– World Resource Institute’s AQUEDUCT Water Risk Atlas; The International Benchmarking Network. (2023).</p> <p>Additional details about estimating monetary value can be found in ‘Section 4.3: Monetary Valuation’ and ‘Appendix B: Methodological Details.’</p>

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ESTIMATING CHANGES IN CAPITALS AND IMPACTS	
6. Data inputs	<p>The data sources are extensive and embedded within the models and associated citations therein.</p> <p>For data sets, see 'Appendix B: Methodological Details' along with the primary literature sources cited in each.</p>
VIEWS OF AFFECTED STAKEHOLDERS	
7. Representation of those affected	<p>The impact accounting methodology is overseen by a Valuation and Technical Practitioner Committee (VTPC) and developed through due process designed to ensure stakeholder inputs and representation.</p> <p>This process includes independent research, expert engagement, piloting, and a public comment period prior to finalization by the VTPC.</p> <p>In addition, the models included data inputs and feedback from a globally diverse sample of countries leading to better representation of global stakeholders. The application of the value factor at a local level also increases stakeholder-specific representation of impacts.</p>
ETHICAL DECISIONS	
8. Equity weightings and income adjustments	<p>The global valuation perspective adjusts for income differences via PPP adjusting the impacts of the impact pathway. Additional equity weighting adjustments are not incorporated into the official methodology but are outlined as complementary assessment in Appendix B.</p>
9. Accounting for future impacts	<p>The value factor for financial costs to access future water captures future impacts through the year 2080.</p> <p>Future impacts are discounted using a 2% discount rate. See 'Section 4.3: Monetary Valuation' and 'Appendix B: Methodological Details' for more information about discounting.</p>
10. Other ethical considerations	<p>DALYs were valued in the absence of age weighting or discounting. This decision is aligned with the Global Burden of Disease (GBD), with the justification that every year of life for every person, regardless of nationality and independently of when in life health was affected, should be counted and valued equally.<sup>138</sup></p>
SENSITIVITY	
11. Sensitivity to key variables	<ul style="list-style-type: none"> <li>All value factors are sensitive to local water scarcity and pressure on biodiversity, which can scale national to local value factors by up to five times. However, this reinforces the high spatial variability in both variables and the importance of local valuation for water consumption.</li> <li>The aggregated value factor is sensitive to extreme outliers of any of the four value factors. This most commonly occurs with VFAccess which is mostly driven by high values in areas of current and future water scarcity.</li> <li>The distribution of value factors across countries also varies across the four categories of impact. Three of the four value factors (VFAccess, VFNutrition, and VFDisease) have numerous countries with no impact (see Box 1). This results in the final valuation (VFH2O-site) being sensitive to those countries with large values for one of these value factors. The value factor for ecosystem services (VFES) is more evenly distributed as most countries have some non-zero ecosystem services linked to water consumption.</li> <li>For more information on sensitivity see Box 1, 'Appendix B: Methodological Details' along with the primary literature sources cited therein.</li> </ul>

<sup>138</sup>Justifications can be found in Solberg, C. T. et al. (2020). The Devils in the DALY: Prevailing Evaluative Assumptions.

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