ECONOMIST IMPACT

Measuring true water investment impacts: building the Water Access Impact Tool

Methodology report

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Introducing the Water Access Imperative

The ***Water Access Imperative*** is a research programme by Economist Impact, supported by Grundfos and Grundfos Foundation. Its goal is to drive increased investment in safe-water access—particularly in the Global South—by showing its social and economic value and by defining a robust methodology to measure impact.

The programme rests on two pillars:

- **Advocacy and awareness**: Helping non-governmental organisations (NGOs), foundations, public agencies (governments and multilateral institutions) and companies make a stronger case for investing in water access.
- **Investment and strategic planning**: Enabling investors and corporate partners to understand the costs, benefits and potential risks of water-access investments.

Introducing the Water Access Impact Tool

The ***Water Access Impact Tool*** translates water-access investments into measurable outcomes. It estimates the social and economic impacts of providing communities with access to safe drinking water and allows comparison across countries and contexts.

It is a national-level tool, focusing on countries with significant access gaps. It helps decision-makers to identify where resources can achieve the greatest effect. The model builds on the groundwork of the World Health Organisation-UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) and complements existing project and business-focused tools and frameworks, such as the WASH4Work Benefits Accounting Framework.[1]

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SECTION 1

Building the tool | High-level approach and design

This section outlines the overall approach used to develop the Water Access Impact Tool and the steps taken to test and refine its framework. Economist Impact followed a two-phase process to build the model and deepen understanding of the water-access landscape.

Phase 1: Inception

The first phase centred on research and expert engagement. We conducted an extensive literature review and held consultations with experts to confirm the need for such a tool. Insights from these activities shaped a credible conceptual framework for the tool.

Phase 2: Model development and execution

In the second phase, we refined the approach based on expert feedback and began building the model framework. We first piloted the approach in Ethiopia, then expanded to other countries.

A cluster analysis was used to examine similarities and differences across country contexts, guiding the choice of countries. We then gathered data for each pilot and integrated it into the model. The completed framework was embedded in an online platform that allows users to input investment choices and estimate the social and economic effects of water-access investments.

The model assumes that the scale of impact depends on the number of people who gain access to safe water. Using a scenario-based approach, it evaluates key social and economic outcomes relative to current baselines to quantify total benefit.

Further detail on the background research and model-building process is provided in **Appendix C**.

SECTION 2

User journey | From inputs to impacts

This section explains how users interact with the Water Access Impact Tool and how their inputs feed into the model to produce cost and impact estimates. It outlines the tool's core components: user inputs, cost estimation and impact calculation.

Overview of the user journey

Based on user inputs for a specific intervention, the tool first estimates how many people can gain access to safe water, and at what cost. These estimates then feed into calculations of the intervention's social and economic impacts.

User inputs

Users make two sets of selections that determine how the model runs:

1. **Intervention type and context**. The first set of choices defines the water intervention—its location (urban or rural), service level and system capacity. These determine the likely cost structure.
2. **Population and impact parameters**. The second set of choices allows the user to provide input on the scale of the investment based on:
    - The number of people the intervention aims to reach, **or**
    - The total investment made towards construction and operation, **or**
    - The target volume of water to be delivered to communities

Cost estimates

For each combination of user inputs, the model calculates an average unit cost for building and operating the water intervention in the chosen context. Costs vary by geography and system capacity—urban versus rural settings, for instance, or family-sized versus large systems.

The estimated unit cost enables the model to project the number of people who will benefit from the intervention, the total investment needed for construction and operation, and the volume of water delivered to target communities, based on previous user inputs.

Impact estimates

Using estimates of the number of beneficiaries (either user-provided or model-calculated) and other contextual user inputs, the model calculates the expected socioeconomic gains from the intervention. The main drivers of impact are:

- Improved health and reduced mortality through lower incidence of water-borne diseases
- Time savings from reduced water collection, contributing to greater school or work participation

These lead to measurable improvements in productivity, reduced healthcare costs and wider economic benefits across communities.

User selections

Designing a water intervention begins with understanding the local context—its population density, existing water sources and hydrology. The Water Access Impact Tool prompts users to provide information that would help to determine this context through a series of selections that define the type and scale of intervention appropriate for that setting.

Users make choices in four areas:

- Country
- Urban or rural context
- Service level
- System capacity

Country selection

The first step is to select a country from a provided list. Countries have been prioritised based on their current levels of water access, with those showing the lowest rates of safely managed water given precedence.

Urban or rural context

Approaches to expanding water access differ widely between rural and urban areas, shaped by geography, hydrology and available water sources. Identifying the setting allows the tool to match the most suitable intervention types used in similar contexts.

The table below provides illustrative examples of common water interventions used in both urban and rural contexts across countries.

Table 1: Common interventions in rural and urban contexts

Rural interventions	Urban interventions
Cistern	House connection
Deep borehole	Public tap
Shallow borehole	Yard connection, individual
Hand-dug well	Yard connection, shared
On-spot spring	Service delivery model: self-sufficiency
Protected pond	
Rainwater harvesting	
Rural piped system, borehole	
Rural piped system, spring source	
Service delivery model: self-supply (household)	

See **Appendix A** for full definitions of the interventions listed in Table 1.

Service level

The service level reflects the tier of water access an intervention can provide, aligned with the Joint Monitoring Programme (JMP). Whereas the original JMP ladder includes five levels of access (from *surface water and unimproved* to *safely managed*), this tool focuses on two tiers:

- Safely managed—drinking water from an improved water source that is accessible on premises, available when needed and free from contamination
- Basic/limited—drinking water from an improved source where collection time is no more than, or exceeds, 30 minutes for a round trip

Unimproved and surface-water interventions are excluded. The selected service level determines which interventions are suitable for a given investment.

System capacity

Following an extensive global literature review, water interventions were categorised based on two key factors: the number of beneficiaries reached and the volumetric capacity of each system.[3,4,5,6,7,8] This led to four distinct classifications: family-sized, small, medium and large systems (see **Table 3** for details).

Details of how the volume of water delivered by each system was calculated are provided in **Table A3**.

Table 2: Water-access service level specifications

Conditions for drinking water supply	Safely managed	Basic/limited	Unimproved/surface
Improved source	Yes (*piped water available on plot or yard/in dwelling, protected wells/rainwater storage located on premises*)	Yes (*protected community tube well, dug well, boreholes, springs, cistern, dams, rainwater harvesting, public standpipe, tanker/vendor water*)	No (*water sourced directly from rivers, unprotected wells and springs*)
Accessible on premises	Yes	No	No
Available when needed	Yes	Maybe	No
Collection time < 30 mins	Yes	Maybe	No
Free from faecal and priority chemical contamination (arsenic and fluoride)[2]	Yes	Maybe	No

Table 3: Capacity-level specifications

Capacity of system	Example interventions	No. of beneficiaries (*# people*)		Volume of water (*litres per day*)	
		Lower limit	Upper limit	Lower limit	Upper limit
Family-sized	Family well[9], rainwater harvesting on premises	1	19	25	475
Small	Protected hand-dug well, springs, shallow well	20	499	476	12,475
Medium	Public standpipe systems, protected springs, boreholes, piped water schemes serving household connections[10]	500	6,499	12,476	162,475
Large	Public standpipe systems, boreholes, piped water schemes serving household connections	6,500	100,000	162,476	2,500,000

Intermediate calculations: cost estimates

To estimate the cost of providing safe water through different interventions in a given context, we aggregated the individual life-cycle costs of different water interventions based on their capacity, level of service and whether they are in an urban or rural context, using a weighted average approach. Life-cycle costs encompass the total expenditure on building, operating and maintaining an intervention throughout its lifespan.

Our approach involved the following steps:

1. **Identify interventions**: We first determined the most common water-delivery interventions using improved sources in both rural and urban areas. These were identified using survey data from the UNICEF/JMP database.
2. **Calculate life-cycle costs**: For each identified intervention, life-cycle costs were calculated by estimating components such as capital expenditure (CapEx), operating expenditure (OpEx) and capital maintenance expenditure (CapManEx) based on a literature review. All raw cost figures were first adjusted for inflation and thereafter converted to US dollars (2023).
3. **Aggregation**: Individual life-cycle costs were aggregated using a weighted average approach, based on the intervention's relative prevalence in each country, capacity, service level and whether it is in an urban or rural context.
4. **Estimate beneficiaries and volume**: The literature review also provided estimates for the average number of people served and the average volume of water delivered by each intervention, with disaggregation for urban/rural settings where possible.

Based on the varying costs of individual interventions within each country, we ultimately calculated system-level weighted average costs. This resulted in 16 distinct cost permutations, outlined in Table 4.

Table 4: Water-system permutations

16 system permutations			
	Capacity size	Urban/rural context	Service level
1.	Family-sized	Rural	Basic/limited
2.	Family-sized	Urban	Basic/limited
3.	Family-sized	Rural	Safely managed
4.	Family-sized	Urban	Safely managed
5.	Small	Rural	Basic/limited
6.	Small	Urban	Basic/limited
7.	Small	Rural	Safely managed
8.	Small	Urban	Safely managed
9.	Medium	Rural	Basic/limited
10.	Medium	Urban	Basic/limited
11.	Medium	Rural	Safely managed
12.	Medium	Urban	Safely managed
13.	Large	Rural	Basic/limited
14.	Large	Urban	Basic/limited
15.	Large	Rural	Safely managed
16.	Large	Urban	Safely managed

The initial selections made by the user in the three categories—urban/rural context (rural or urban), service level (basic/limited or safely managed) and capacity size (family-sized, small, medium or large)—allow the model to identify the relevant system-level weighted average cost from the 16 permutations.

A detailed breakdown of the cost-estimation process is available in **Appendix A**.

User input: input variable selection

The next step in estimating impact is to define the key input variable. Users select **one** of three variables and enter a corresponding numerical value.

- **Volume of water**: the quantity of water that can be delivered by the selected intervention, measured in litres per day.
- **Investment amount**: the total monetary value of the intervention, measured in US dollars (millions).
- **Number of people reached**: the number of beneficiaries who will gain enhanced access to water.

Model parameters

Once a user provides one of these values, the model estimates the remaining two automatically. All three parameters—volume of water, investment amount and number of beneficiaries—are required to calculate the full range of impacts.

Impact estimates

A detailed literature review underpins the tool's approach to measuring the benefits of expanded water access. The evidence shows that water supports prosperity through three core channels:

- **Health**: as a source of safe drinking water.
- **Economic production**: as an input for several economic sectors (e.g. agriculture, industry and services).
- **Ecosystem support**: as a foundation for environmental resilience.[11]

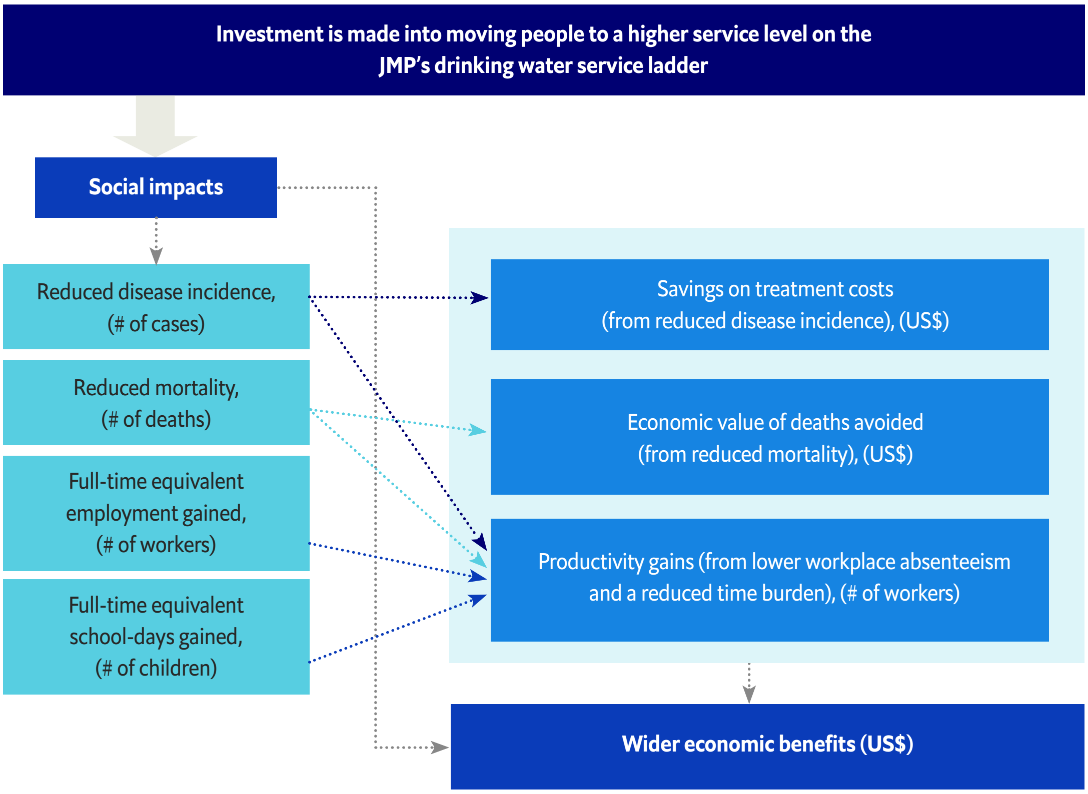
Expanding water access produces a wide range of **social, economic and environmental** benefits. These vary by region and by group—women, girls, students and farmers often gain in distinct ways.

We selected three main pathways to capture these effects:

- **Health impacts**: Reduced disease and mortality as a result of cleaner water.
- **Labour and education impacts**: Time saved from water collection, and greater school or work participation.
- **Economic impacts**: Higher productivity, lower health costs and spillover gains across the local economy.

Each of these pathways contributes to the model's overall estimate of the social and economic value of improved water access.

Figure 1: Visual representation of social and economic impacts across different pathways



In the model, the scale of social and economic benefits from improved water access depends mainly on how many people gain access. Using a scenario-based approach, we assessed key outcomes by identifying relevant indicators and comparing projected results with current baseline values.

We found that communities that rely on **unimproved water sources** face two main challenges:

- **Contaminated water**: Water drawn from unsafe sources is often polluted with faecal or chemical contaminants. Its use for drinking, cooking or sanitation leads to a high incidence of water-borne diseases—what we call the *disease burden*.
- **Limited availability**: Water is often unavailable on premises or when needed, requiring long collection times. This burden falls disproportionately on women, girls and children, reducing time for education and other economically productive activities. We refer to this as the *time burden*.

Access to **improved water sources** reduces both the disease and time burdens. The resulting benefits appear in several forms:

- **Health gains**: Fewer cases of water-borne illness and fewer days lost to sickness.
- **Time savings**: Less time spent collecting water or recovering from illness.
- **Economic effects**: Lower household and healthcare costs, higher productivity and wage gains from reduced absenteeism.

Further detail on the calculation method and assumptions is provided in **Appendix B**.

SECTION 3

Model considerations | Assumptions and limitations

This section summarises the key assumptions underpinning the Water Access Impact Tool and notes the main limitations of the current model. These will be reviewed and refined as more data and methods become available.

Key assumptions

Defining water access

For this model, water access refers specifically to water used primarily for drinking. The definition combines three elements:

- ***Drinking water***, as it is the most basic requirement, carries significant societal impacts, and is key to human survival.
- ***Physical access*** to water/water distribution/water service delivery—not specific water sources—as there is uneven access to water services between rural and urban areas.
- ***Household access*** to water, a standard measurement that allows comparison across countries.

Macroeconomic factors influencing the investment environment

External or country-level conditions can affect the success of water investments. Based on literature and expert input, we identified several country-level risks, such as political fragility, macroeconomic challenges and environmental threats, as well as governance factors such as regulatory quality, rule of law, corruption and accountability.

These factors were incorporated qualitatively into the model to provide context for each country's investment environment. Although they do not influence cost calculations directly, they are represented through quantitative scores drawn from recognised sources such as:

- Economist Intelligence Unit (EIU) Risk Briefings
- Notre Dame Global Adaptation Initiative (ND-GAIN)
- Worldwide Governance Indicators

Key limitations

Although the model represents a credible effort to estimate the realities of implementing water-access interventions and assessing their impact, we acknowledge the limitations in our current approach and recognise opportunities to expand its scope in the future.

- **Inclusion of existing water systems**: The model relies on a set of underlying cost assumptions to estimate the cost of building water-access interventions. These cost estimates are based on an assumption that the existing systems will continue to be used in the future to deliver water at the desired service level. Continued technological innovation can yield newer water systems that deliver similar volumes of water at lower costs.

- **User fees**: Although building cost estimates and running impact calculations, our model does not account for user charges that are expected to be paid by consumers in most interventions. Differing user charges may affect the system's adoption among consumers and the total returns from the investment.
- **Weighted average approach to cost calculations**: To estimate the cost of delivering water through a set of water-access interventions in a given country context, we aggregated the individual life-cycle cost of different water interventions based on their capacity, level of service and urban or rural context using a weighted average approach. We are conscious that this approach to cost estimation may be a simplification.
- **Limited measure of disease burden**: Under the impact pathways, we calculate the social and economic impacts from a reduced disease burden. For the calculated disease burden, we include only one water-borne illness, diarrhoea, which is the most common water-borne illness associated with unsafe drinking water. There remains scope to expand calculations from the disease burden to other water-borne illnesses.
- **Missed benefits of access to drinking water beyond households**: In their present form, the impact measures take into account only the benefits accruing to the population from safe drinking water. We do not account for other benefits from improving water availability, such as water as an input for economic sectors and as critical support for ecosystems.[12]
- **Limited measure of educational impacts**: Improving access to water reduces the time burden for young children who are engaged in water collection, freeing them up to spend more time on school work. A reduced disease burden stemming from access to clean water reduces school absenteeism, allowing young children higher school attendance, which can have a long-term impact on educational outcomes, particularly for girls. These long-term impacts are not captured in the model in its present form.
- **Climate resilience**: In the present state of the model design, we do not account for the direct costs of building and operating climate-resilient systems in cost estimates, largely owing to methodological challenges and data limitations. Instead we include broader climate vulnerability in our framing of the country risks and the enabling environment for investments.

APPENDIX A

Detailed approach to estimating costs

Cost estimations

Our cost estimations were determined based on a series of water-access interventions. From our literature review, we identified a set of the most common interventions across countries. The list of interventions and their definitions is presented in Table A1.

Table A1: Water-access interventions, definitions

Intervention	Definition
Rural interventions	
Cistern	An underground masonry container that collects transported water and runoff
Deep bore hole	A shaft drilled to a depth of 60 metres or more
Shallow bore hole	A shaft drilled to a depth of less than 60 metres
Hand-dug well	A hand-dug water point that taps water from a shallow water table. Most dug wells are less than 20 metres deep
On-spot spring	A spring with no distribution system. Water is extracted on the spot
Protected pond	A small reservoir that collects rainwater and runoff for livestock watering, irrigation and, with water treatment, human consumption
Rainwater harvesting	The collection of rainwater or runoff and its productive use for domestic consumption, irrigation and livestock watering
Rural piped system, borehole	A piped system for water distribution over large rural areas, either gravity based or pump powered, fed from a borehole
Rural piped system, spring source	A piped system for water distribution, either gravity based or pump powered, fed from a protected spring
Service delivery model: self-supply (household)	Improvement to water supplies developed largely or wholly through user investment[13]

Table A1: Water-access interventions, definitions (cont.)

Intervention	Definition
Urban interventions	
House connection	A private water supply by tap located inside a homestead building
Public tap	A facility, such as a fountain, that has two or more faucets for communal use
Yard connection, individual	A private water supply from a tap in the yard of the resident
Yard connection, shared	A water supply from a tap in a common place that provides water to neighbourhood users
Service delivery model: self-sufficiency	The ability of a town water-supply service to operate independently and earn sufficient income from water sales to pay for operation, maintenance, expansion, administration, accounting and staff

Through our literature review and consultations with technical water experts, we identified a critical set of cost and non-cost variables that together determine the life-cycle cost of different water interventions. The table below provides an overview of each variable and a short summary of its relevance.

Table A2: Life-cycle cost components of different interventions

$$\textit{Life-cycle cost} = \textit{CapEx} + (\textit{OpEx}^{14} * \textit{Years of operation}) + \textit{CapManEx}$$

Definitions of cost components

Life-cycle cost: We used a holistic method to estimate the cost of building and maintaining different individual water interventions across their full lifespan based on the life-cycle cost approach of Hutton and Varughese (2016)[15] and IRC WASH (2019).[16] The life-cycle cost consists of the following components: CapEx, OpEx and CapManEx. All costs are adjusted to US$ 2023 prices.

CapEx: The initial investment required to build the physical fixed asset for the water intervention, e.g. pipes, a well or rainwater storage tank. This also includes the costs involved in consulting relevant stakeholders before the physical fixed asset is constructed. Construction costs are key to estimating the overall cost of an intervention.

OpEx: OpEx occurs year on year to preserve the intervention throughout its lifespan (also known as preventative maintenance). This expenditure typically consists of the cost of operating materials needed to provide a service, regulation, ongoing protection, monitoring of water sources, water treatment and distribution, and continuous education activities.

CapManEx: Maintenance of hardware, replacement of parts and renovation or rehabilitation when required to extend the life of the hardware to its expected lifespan. Major capital maintenance expenditure typically occurs at the half-life mark of an intervention.[17]

Lifespan: The lifespan of a water intervention refers to how long the intervention is expected to function reliably and safely, if appropriate maintenance functions are carried out. Factors influencing the lifespan of a water intervention include its design, complexity, construction quality, regular maintenance, patterns of usage and external environmental factors. For instance, the typical lifespan of a hand pump is ten years, whereas a borehole could work well for 20 years. The intervention's lifespan is used to calculate the total OpEx.

Cost-estimation approach

Step 1: Identifying interventions and estimating life-cycle costs

A review of national datasets, Afrobarometer surveys and UNICEF Multiple Indicator Cluster Surveys (MICS)[18] helped to identify the most common improved water source interventions in urban and rural areas.[19] For each intervention, the team calculated CapEx, OpEx and CapManEx.

- ***CapEx*** figures were derived mainly from government, multilateral and academic sources relevant to each country, as well as figures presented by Hutton and Varughese (2016).[20]
- ***OpEx*** figures follow assumptions used by Hutton and Varughese (2016).[21] For all interventions bar piped household connections, OpEx is set at 10% of CapEx for each year of the intervention's expected lifespan. For household piped connections, OpEx equals the cumulative water tariff paid by households over a 20-year lifespan. The total OpEx for piped connections is obtained by multiplying the cubic metre water tariff rates with the following factors:
    - average household size[22]
    - daily drinking water requirements per person[23]
    - lifespan of the household connections
- ***CapManEx*** is set at 30% of CapEx for all interventions, in line with assumptions used by Hutton and Varughese (2016).[24]

Where recent cost data were lacking, older figures were adjusted for inflation and exchange-rate movements to US$ 2023 prices.

Literature estimates were also used to determine the likely number of beneficiaries for each intervention, broken down by urban and rural areas.

Step 2: Determining system-level variables

Table A3 describes the system-level parameters that are calculated by the model. These are weighted average cost, weighted average beneficiaries and the volume of water that can be delivered by the system. These system-level variables are aggregated across interventions within the same system group to arrive at a weighted average of the number of people reached and the volume of water that can be delivered.

Table A3: Determining system-level variables

Cost of system
After calculating the life-cycle cost of different interventions, the interventions were categorised into 16 system-level permutations based on their usage in urban/rural areas, beneficiaries served and service delivered in a given country. Relative prevalence shares for interventions were accessed from national-level datasets and UNICEF MICS[25,26,27,28,29,30] and used to determine the system-level weighted average cost for each of the 16 system-level permutations. This variable is expressed in terms of US$ (2023 prices).[31]

People served by the system
A weighted average was calculated using relative prevalence shares as weights, across the number of people that could benefit from an individual intervention within one system permutation, to determine the number of people served by one system.

Volume of water delivered by the system[32]
The volume of water delivered daily by a system is calculated by multiplying the number of people served by the minimum daily water consumption per head. The minimum daily water consumption per head was established at 25 litres/day through literature review. This figure is considered the minimum necessary quantity for drinking, cooking, personal hygiene, food hygiene and other domestic hygiene needs, based on a review of WHO's drinking water quantity guidance, minimum water requirements in emergency situations. This variable is expressed in terms of *litres/day*.

Step 3: Calibrating cost estimates

A final calibration step ensured internal consistency and alignment with global evidence.

Two approaches were used:

1. **Direct cost estimates**: Where reliable country-level data were available, CapEx figures were adjusted for inflation and exchange rates and used directly.
2. **Benchmarking**: Where data were scarce, costs were benchmarked against the World Bank's estimates in *The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene.*[33] Standard cost ratios between basic and safely managed services were used to refine projections. Purchasing Power Parity adjustments were applied where regional benchmarks were more reliable than national data.

All costs are reported in **US$ (2023 prices)**.

APPENDIX B

Detailed approach to estimating impacts

Establishing parameters to address impacts

Our impact estimates rest on two forms of burden faced by people relying on unimproved water sources: disease and time. These burdens feed into three pathways—health, labour and education, and wider economic gains.

Disease burden refers to the prevalence of water-borne illness caused by the consumption of contaminated water, most often diarrhoea. It carries social and economic costs: treatment expenses for households and lost income from time away from work.

Time burden reflects the hours spent collecting water where it is not available on-site. This task falls mainly on women, girls and young children. The time lost reduces adults' ability to work and children's ability to attend school.

Estimating impacts across the selected pathways

All impact calculations compare a baseline, where no new investment is made, with an investment scenario, where more people gain access to safe water. The difference between these scenarios produces the impact estimates.

Health pathway

The health pathway measures improvements that stem from reduced exposure to contaminated water.

- **Reduction in water-borne disease**: Disease incidence is calculated for both scenarios to estimate the number of infections prevented through improved water access, using data on diarrhoea rates from the Global Burden of Disease database and literature estimates of how incidence falls when moving from basic/limited to safely managed water access.[34]
- **Savings on healthcare spending**: Fewer infections mean lower total costs for treatment, hospital visits and transport. Our calculation uses treatment costs that differ based on the severity of symptoms, drawing on established literature, as well as an estimate of the share of people with diarrhoea who seek care.
- **Deaths avoided**: Fatalities are estimated using diarrhoea case-fatality rates from the Global Burden of Disease database and literature on the decline in fatality rates with access to safely managed water.[35] The difference between the number of deaths in the baseline scenario

and the investment scenario represents the diarrhoeal deaths prevented by providing people with access to improved water sources.

- **Economic value of deaths avoided**: We apply country-level estimates of the value of a statistical life to the number of deaths prevented to quantify this benefit.

Labour market and education pathway

Improved water access allows people to study, work and contribute more productively.

- **Full-time equivalent employment gained**: We measure hours saved from fewer sick days and shorter water collection times. Estimates of hours lost to sickness among working-age adults provide the basis for calculating hours saved from fewer sick days. For time savings, we draw on socioeconomic surveys on time spent collecting water. We then convert these savings into the equivalent number of employment hours that can be gained by a commensurate number of workers working full time, who are already a part of the labour force.
- **Full-time equivalent school days gained**: Using estimates of hours saved when school-age children no longer need to collect water, we convert these savings into potential school days gained.
- **Productivity gains**: We measure wage gains from fewer sick days and from time saved on water collection. For gains from a reduced disease burden, we use estimates of sick days, hourly wages and the number of working days per year to calculate the potential wage gains that could be incurred from reduced workplace absenteeism for an entire year. For gains from a reduced time burden, we use data from socioeconomic surveys on the time spent on water collection to calculate the potential wage gains using estimates of hourly wage rates (International Labour Organisation data).[36]

These metrics do not imply a larger workforce or school population; they express the value of hours recovered.

Economic pathway

Beyond health and productivity, water investments stimulate wider economic activity. Spending on construction, operation and maintenance creates demand across the economy. Country- and sector-specific multipliers, derived from literature, capture these indirect gains

Returns on investment

The model compares lifetime costs—CapEx, OpEx and CapManEx—with the monetary value of all benefits, including healthcare savings, productivity gains, avoided deaths and wider economic effects. The difference is expressed in terms of:

- Net present value (NPV): the difference between the discounted stream of benefits and costs over the asset's lifetime.
- Benefit-cost ratio (BCR): the total lifetime return from the investment relative to its total cost.

A positive NPV and a BCR above one both reflect an investment that delivers gains exceeding its cost.

APPENDIX C

How we built the tool

Literature review and data audit

We began with a detailed desk review to understand the scale of global drinking water access gaps, the role of investment and the barriers that slow progress. This included peer-reviewed research, academic work and practitioner reports.

Alongside this, we carried out a data audit to identify reliable sources for modelling. Key inputs came from:

- **World Resources Institute Aqueduct**, for global water-risk data;
- **World Bank Water Data**, covering service delivery and resilience;
- **WHO / UNICEF Joint Monitoring Programme (JMP)**, for country, regional and global estimates of progress on drinking water, sanitation and hygiene;
- **UN-Water SDG 6 Data Portal**, for global indicators linked to water and sanitation;
- **FAO Aquastat**, for data on water resources and agricultural water management;
- **IHME Global Burden of Disease**, for data on water-borne illness from unsafe water;
- **ILOSTAT**, for wages and labour-market data;
- **IRC WASH**, for life-cycle cost estimates of water interventions;
- **World Bank WASH Project Appraisal Documentation**, for region-specific cost estimates and beneficiary numbers for water interventions;
- **Country-level reports and surveys**, for country-specific data on water-access gaps and cost estimates and number of beneficiaries for different interventions.

Pilot country selection

To stress-test the model, we chose three pilot countries using three criteria:

- **State of water access**: We prioritised countries with the lowest share of people using improved drinking water sources. Of the 20 countries with the lowest share based on the JMP dataset, 18 are in Sub-Saharan Africa.
- **Enabling environment**: Using Economist Intelligence Unit operational-risk scores, we selected countries with moderate (rather than high) risk profiles, where projects are more likely to succeed.
- **Data availability**: We required countries with sufficient data on construction, operation and maintenance costs for common water interventions.

On this basis, we selected Ethiopia, the Democratic Republic of Congo and Uganda as the first pilot countries.

Expert input and engagement

At each major stage we sought feedback from leading water experts.

In the initial stage, we conducted in-depth interviews with experts at UNICEF, World Resources Institute (WRI) and Cummins. These conversations tested the initial conceptual approach, identified early strengths and weaknesses, and built a network of early champions for the tool.

Between May and June 2024 we ran a structured validation exercise, followed by advisory board meetings in July and November 2024. These sessions brought together specialists from development institutions, financiers, NGOs and academia to test our assumptions, definitions and model approach.[37]

We also held one-to-one consultations with organisations such as Water.org, CEO Water Mandate, WaterAid and WRI, including a detailed review of the beta version of the tool before its soft launch in May 2025. Guy Hutton, a senior economist and financing specialist working in water, sanitation and hygiene, served as a formal adviser, guiding the model framework and reviewing underlying data.

We presented the early concept for the tool to a group of attendees at World Water Week 2024 in Stockholm to gather initial reactions and refine the direction of the tool.[38] In January 2025 we demonstrated the planned user interface at a Davos side event. In May 2025 we moderated roundtables at the Global Water Summit in Paris.[39] The sessions brought together senior industry, municipal and international water leaders and provided detailed feedback on the model and its value for users.

Endnotes

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13. Self-supply in WASH refers to the unsubsidised construction of a household water supply, or a water supply shared by a small number of households (typically 2-4). The technologies used vary. Water sources include: hand-dug wells; manually augered wells; and rainwater harvesting using roof catchments. Lifting devices include: rope and bucket with, or without, a windlass; simple bucket or rope and washer pump; and, in some instances, more sophisticated diesel, electrical or solar-powered pumps. IRC WASH. A Hidden Resource: Household-led rural water supply in Ethiopia. August 2013. Available at: https://fr.ircwash.org/sites/default/files/a_hidden_resource_web_version_aug_2013.pdf
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22. Average household size differs for each country. Data was obtained from country-specific socioeconomic surveys.
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32. We calculate the volume of water delivered by a water intervention with the assumption that the intervention is running at full capacity with no water losses.
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37. The first advisory board meeting included representatives from Water.org, Incofin's Water Access Acceleration Fund, Hilton Foundation, World Resources Institute, Columbia Water Center, and CEO Water Mandate/WASH4Work. The second advisory board meeting included representatives from CEO Water Mandate/WASH4Work, IRC WASH, WaterAid's Resilient Water Accelerator, Mercy Corps, Gap Inc and Water.org.
38. The session at World Water Week in Stockholm included representatives from the IDB, Incofin, IRC WASH, charity:water, Stone Family Foundation, Resilient Water Accelerator, WaterAid, Water.org, Mercy Corps, Geneva Water Hub, Fundação Getulio Vargas (FGV) and Ragn-Sells - EuRIC.
39. The session at the Global Water Summit included representatives from the World Bank, Veolia, AWS, Rabobank and Emerald Technology Ventures.

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