

Water, Sanitation and Hygiene (WASH)

Cost-Benefit Analysis



NOTE

This technical summary presents the Water, Sanitation and Hygiene (WASH) Economic Analysis for projects funded by World Vision Canada from 2019 to 2021, conducted by Limestone Analytics. Updates to this analysis will occur as additional projects adopt this model and new evidence is continuously collected. Consequently, figures may change to reflect a more accurate understanding of the pathways through which the model achieves its effectiveness and efficiency. All dollar values are reported in 2023 USD at a 9 per cent discount rate.

Introduction

Water, sanitation and hygiene (WASH) projects can improve community health, save lives and protect children from harm. Inadequate access to WASH remains a significant development challenge. It contributes to the global burden of diseases and undermines efforts to improve health outcomes, particularly among vulnerable populations. According to a WHO/UNICEF Joint Monitoring Programme, an estimated 530 million rural Africans, 640 million rural South Asians, and 46 to 52 million people from Latin America and the Caribbean have no or limited access to handwashing facilities. This lack of access to WASH has a number of adverse health effects, the most extreme outcome of which is death. Insufficient access to WASH leads to 1.6 million deaths annually as a result of diarrhea, acute respiratory infections (ARIs), malnutrition, and malaria.

World Vision has implemented hundreds of WASH projects to address this challenge. To assess the effectiveness and efficiency of the WASH core project model (CPM), a cost-benefit analysis was conducted for World Vision Canada (WVC) by the consulting firm Limestone Analytics. The analysis covers 111 WVC-funded implementations of the WASH CPM across 29 countries from 2019 to 2021. Results indicate that the implementations have been cost-effective.

Water, Sanitation and Hygiene Core Project Model

World Vision's WASH CPM seeks to improve the health, nutrition and well-being of children.

This is accomplished through efforts to improve water quality, reduce open defecation and increase access to, and usage of, handwashing facilities. This can be achieved via improved water sources (including, for example, the distribution of chlorination kits), sanitation and handwashing facilities, and community education.

Interventions take place across three components as displayed below in **Figure 1**.

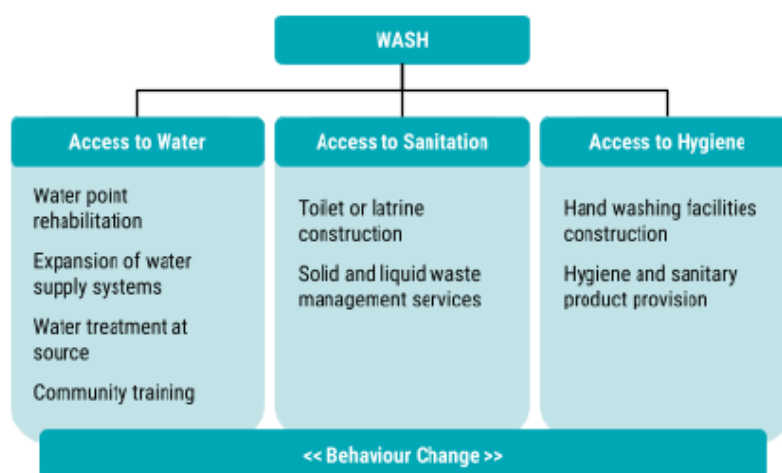


Figure 1. Mapping of WASH interventions across its key components (WVI, 2022)

Methodology

In addition to the health and non-health benefits, the model considers the financial cost to WVC and the manufacturers of the products donated through the gifts-in-kind (GIK) program. Other costs include the maintenance fees required of those communities participating in the WASH CPM.

The three measured health and non-health benefits are:

1. Reduce the incidence of diarrhea, acute respiratory infection and other infections that can cause illness, death, stunting and wasting.
2. Minimize the risk of sexual violence, harassment and psychological stress of women and girls.
3. Increase children's productive time and access to education via time savings from water collection and reduction in school absenteeism.

This analysis applies two alternative approaches to aggregate health benefits across WASH interventions.

The conservative approach assumes that when multiple WASH interventions are implemented for one population, their combined effect is equal to the effect of the single intervention with the largest effect.

The moderate approach assumes that when multiple interventions are implemented for one population, their combined effect is equal to the sum of their individual effects.

Together, the conservative and moderate approaches represent an effective range within which benefits could accrue: the conservative approach represents the lower bound, and the moderate approach represents an effective upper bound.

Note that there are limitations to these approaches. These include that the list of potential benefits and costs is not exhaustive. In turn, this is because in some cases data is unavailable or there is no established methodology to quantify that data.

Portfolio-Level Results

The portfolio of 111 implementations of the WASH CPM undertaken during the 2019-2021 fiscal years incurred a cost of \$23,470,740 and resulted in \$337,244,915 of benefits using the conservative estimation of benefits. This sums to a net present value (NPV)¹ exceeding \$300 million.

¹ Net present value is a way to determine how much money something will make or cost in the future by accounting for the time value of money. It is calculated by subtracting the present value of the costs from the present value of the benefits.

The resulting benefit-cost ratio (BCR) is 14.37, meaning that each dollar spent on WVC WASH programming resulted in \$14.37 in benefits.

The portfolio of WASH implementations is also estimated to have saved 4,901 lives, with 4,220 of these among children under five. The portfolio is estimated to have saved 58,371 disability-adjusted life years (DALYs)², with children under five accounting for 52,620 DALYs averted.

Table 1. Headline results at the portfolio level

Benefit Estimation	Present Value of Benefits	Present Value of Costs	Net Present Value	Benefit-Cost Ratio	DALYs Averted	Mortality Averted	Participants
Conservative	\$337,244,915	23,470,740	\$313,774,176	14.37	58,371	4,901	1,220,111
Moderate	\$358,106,124		\$334,635,385	15.26	61,686	5,180	

Health benefits make up 76.4 per cent of the total benefits, with non-health benefits making up the remaining 21.4 per cent. The specific breakdown is itemized below in **Figure 2**.

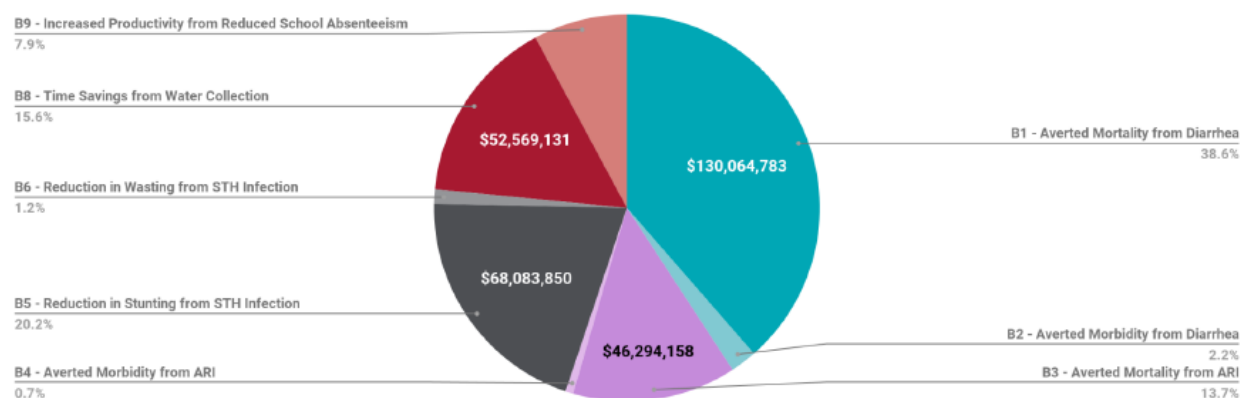


Figure 2. Distribution of present value of benefits (conservative estimate)

At the portfolio level, WVC's investments in WASH have saved an estimated 4,901 lives. The largest number of lives saved is due to reductions in diarrhea among children under five, accounting for 46.5 per cent (2,279 cases) of the mortality averted. This is followed by stunting (27.0 per cent and 1,324 cases) and diarrhea for individuals aged five and above (12.6 per cent and 617 cases).

² Disability-adjusted life year (DALY) measures the total burden of disease. One DALY represents one year of healthy life lost due to illness, disability or early death. It combines years of life lost and years lived with disability to estimate the total impact on population health.

On the cost side, WVC bore the majority, at 61.1 per cent (see **Figure 3**). The remainder was borne by the community in terms of implementation and maintenance costs and a small share was borne by WVC's manufacturing partners who provided hygiene products as gifts-in-kind.

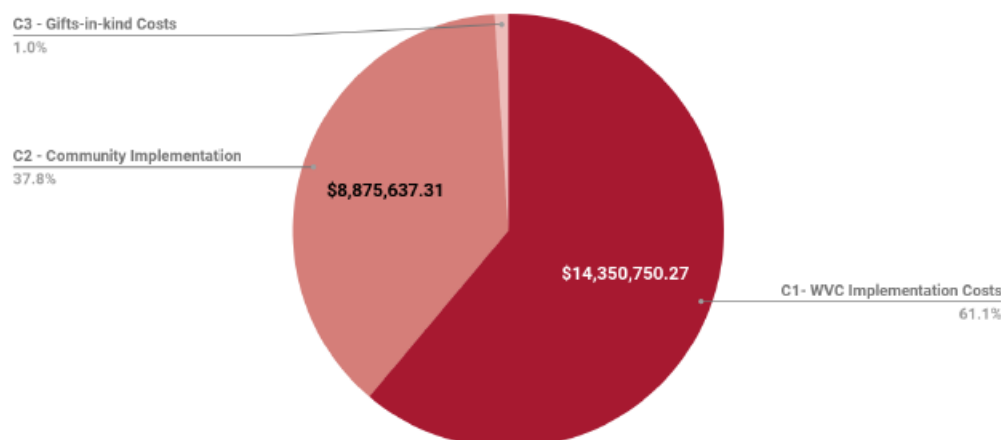


Figure 3. Share of present value of costs

Country-Level Results

The 111 WVC-funded implementations of the WASH CPM span 29 countries. **Figure 4** presents the BCRs of each country's programs using both conservative and moderate estimation techniques. Country-level BCRs range from below one to above 75. Only two countries' implementations are below the BCR threshold of one. This means WVC-funded investments in most of these countries have been a good use of funds, as their benefits exceeded their costs.

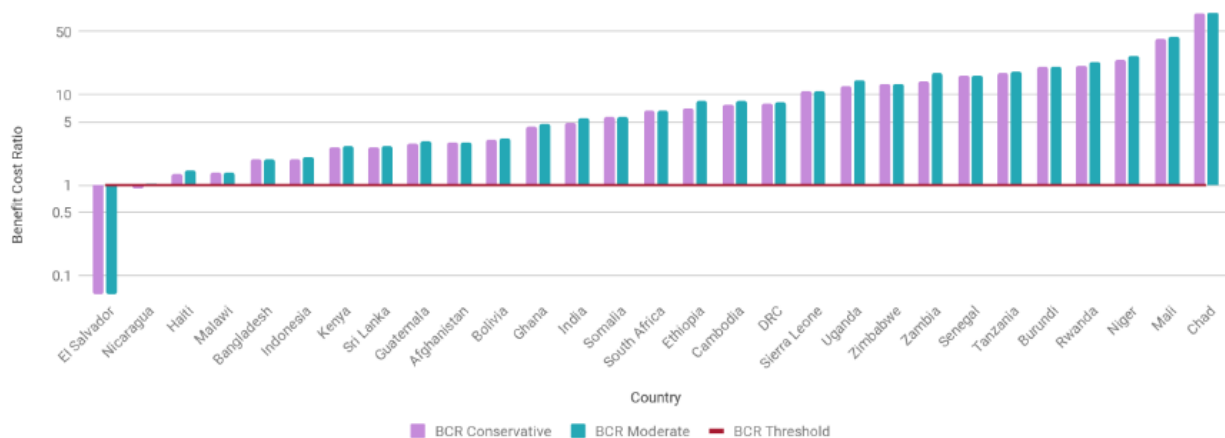


Figure 4. Benefit-cost ratio by country

Project-Level Results

Per the conservative benefits estimation, the median WVC-funded WASH project generated \$322,341 in benefits at a cost of \$125,513, resulting in an NPV well above zero. The median BCR is 3.38, exceeding the threshold of one. The median project reached 3,089 individuals to avert an estimated 30.80 DALYs and 1.08 cases of mortality. The moderate estimate only slightly increases the benefit figures (\$335,764 in benefits, 31.29 DALYs averted, and 1.19 cases of mortality averted), which raises the BCR to 3.41. See **Table 2** below.

Table 2. Median project-level results

Benefit Estimation	Present Value of Benefits	Present Value of Costs	Net Present Value	Benefit-Cost Ratio	DALYs Averted	Mortality Averted		Participants
						CU5	5+	
Conservative	\$328,341	\$125,513	\$218,278	3.38	30.80	1.00	0.08	3,089
Moderate	\$335,764		\$221,344	3.41	31.29	1.10	0.09	

Projects that only implement the hygiene component of the CPM have a higher median and average BCR than those implementing only the water or sanitation components. However, projects that contain a mix of components are more cost-effective than any single-component project, based on the BCR comparison. Water is the only component that, when implemented on its own, has a median BCR below one. However, the average water project's BCR is above one. See **Figure 5** below.

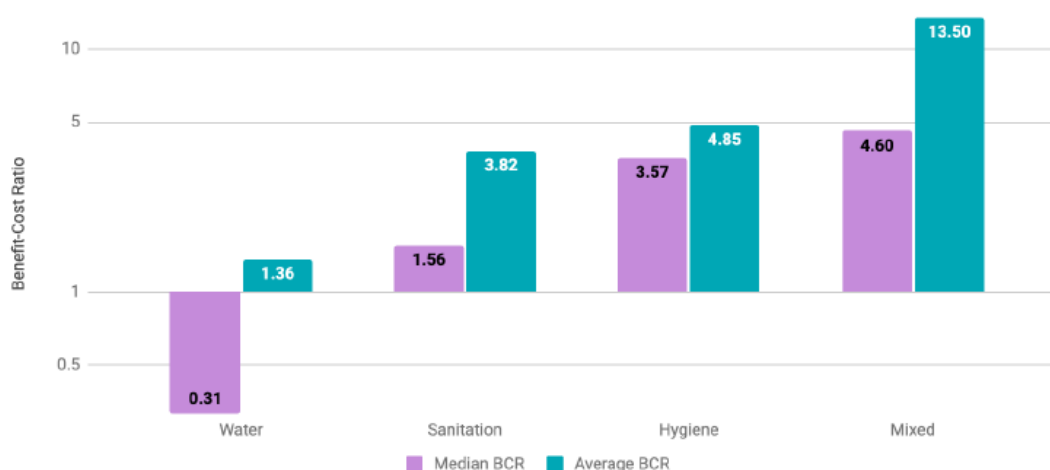


Figure 5. Benefit-cost ratio by WASH component (conservative estimate)

WASH projects also perform differently in different settings, specifically those limited to either community-only versus school-only projects. Findings indicate that education-only projects have a lower median BCR compared to community-only projects. However, education-only

projects are more cost-effective in reaching participants, with the median and average cost per participant being significantly lower than for community-only projects. See **Table 3** below.

Table 3. Project-level results for school- and community-based WASH interventions (conservative estimate)

Project	Number of Projects	BCR		Participants		Cost per Participant	
		Median	Average	Median	Average	Median	Average
Education Only	22	2.55	4.96	2,910	3,430	\$28.60	\$103.47
Community Only	83	3.52	10.96	3,253	13,543	\$47.57	\$175.64

Conclusions and Recommendations

Overall, this analysis finds positive results across WVC's investments in the WASH CPM in the fiscal years 2019-2021, attributable to the significant health and non-health benefits to the participants served. This suggests WASH projects have generally, though not universally, been a good investment of WVC funds across a wide number of countries, generating social benefits that exceed their total costs.

There are a few results that WVC might apply to improve the cost-effectiveness for future implementations of the WASH CPM. Variation in project-level performance suggests that investments in the WASH CPM deliver greater benefits when two or more of the three WASH components (water, sanitation, and hygiene) are included, and that interventions targeting only communities may deliver greater benefits than those targeting only schools.

Two major recommendations arise from this study:

- **Collect disaggregated cost data.** Ideally, future iterations of any WVC programming should disaggregate cost data down to the individual component level (meaning access to either water, or sanitation, or hygiene) to allow for a more in-depth analysis of the cost-effectiveness of various interventions within different contexts. This would also allow for more precision in the current estimates of impact.
- **Collect relevant outcome data to better assess impacts.** This analysis relies heavily on WVC monitoring indicators that pertain to inputs and outputs, but stops short of reporting useful outcomes. For example, the average time to reach the water point prior to and after installation would be a good way to increase the accuracy of the time savings benefit. Given the long-term presence of World Vision projects in many communities, evidence could also be recorded about the extended impacts of WASH investments. This could include the effective lifespans of WASH infrastructure, before-and-after comparisons of the incidence of disease among participants reached (especially diarrhea, ARI, stunting, and wasting), and before-and-after comparisons of student absenteeism rates among students benefitting from WASH interventions (including menstrual hygiene management kits).