Water.org: Meta Study of Existing WSS Research

Thematic paper on Household Finances

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List of Abbreviations

HH	Household
LPCPD	Liters per capita per day
RAG	Red, Amber, Green
RCT	Randomized Controlled Trial
WASH	Water, Sanitation and Hygiene
WC	WaterCredit
WHO	World Health Organization
WSS	Water Supply and Sanitation

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1. Introduction

1.1 Scope of the Meta Study

The objectives of the Meta Study are "*to organize, synthesize and translate the (internal) evidence base into meaningful insights that compel action across donor and sector stakeholders*" and "*to inform Water.org's future research and learning agenda by identifying key evidence gaps where additional insights and research are needed*". These objectives reflect the breadth of the (internal) evidence that already exists and highlights where evidence between Water.org activities and outcomes related to these thematic areas remains weak. Recommendations are also made in terms of Water.org's future learning agenda as well as improving Water.org's programming to strengthen its potential contribution to the five thematic areas.

1.2 Household finances

Improved household finances are widely considered as a crucial benefit of water supply and sanitation (WSS) interventions, with many studies having investigated and quantified different dimensions of the interlinkage between WSS improvements and improved household finances. In line with the leading available literature, this component of the meta-study predominantly focuses on economic value, which is defined as "the sum of financial transactions, hypothetical or actual cash savings, as well as an imputed value for non-market services" (WHO, 2012). The household finances component of this Meta Study investigated the extent of the internal and external evidence base for whether improved water supply and sanitation breaks the cycle of poverty for households living in poverty and increases economic value. It covers five pathways for improvements to household finances:

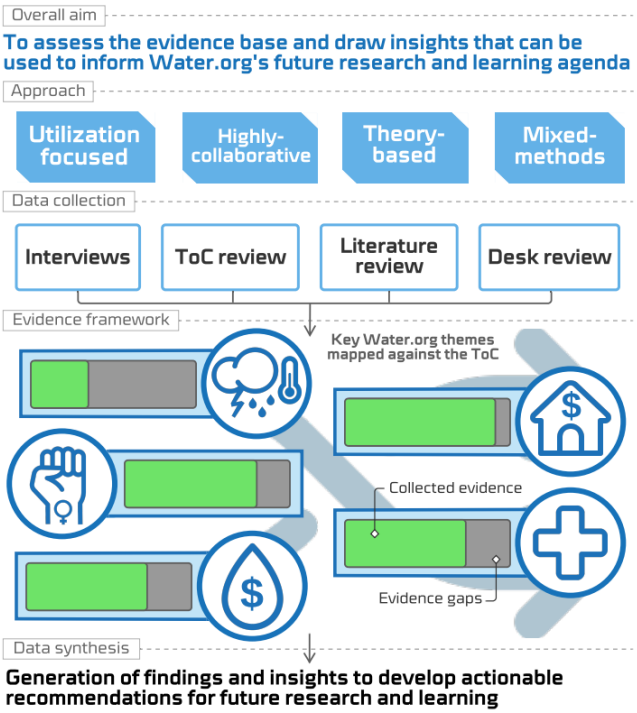
- **Direct and Secondary Income Gains:** Improved water supply and sanitation (WSS) leads to improved household finances through direct (i.e., the selling of water) or secondary (i.e., use of water for the provision of a separate good or service) income gains.
- **Time Gains:** Improved water supply and sanitation leads to improved household finances through time gains from decreased travel time to and from water and sanitation sources and queueing for water, resulting in increased or more productive income-generating activities.
- **Direct Cost Savings:** Improved water supply and sanitation leads to direct cost savings with new, improved water supply and sanitation service costing less than households' previous service.
- **Indirect Cost Savings:** Improved water supply and sanitation leads to indirect cost savings (i.e., reduced healthcare costs).

Figure 1. Meta-study approach and methodology

- **Financial Inclusion:** Water supply and sanitation micro-finance leads to improved financial inclusion.

1.3 Methodology

Figure 1 summarizes the approach and methodology applied for the meta study.



Six stages of work were carried out:

1. Review and reformulation of the thematic theories of change and development of a Theory of Action;
2. Deep dive document and data review for internal evidence. This incorporated a sense check with Water.org core team to identify whether any additional data was available;
3. External literature review to source evidence on associated sub-themes including any gaps identified with the internal evidence;
4. Drafting of the Thematic Paper;
5. Co-creation workshop to develop and refine the associated Theory of Change;
6. Finalizing the Thematic Paper.

Analysis framework: The reformulated theory of change and associated sub-themes was used as the analysis framework.

Internal evidence data sources: The meta study analyzed both primary (interviews with country program managers) and secondary data, quantitative (WaterPortal data and mwater data) as well as qualitative analysis (evaluation reports and other such publications).

External evidence data sources: External literature was sourced using Google Scholar, reference lists in sourced literature, personal libraries, and cross-over and sharing of literature from one thematic area search to another. Both internal and external evidence were entered into a data capture tool for further analysis.

Scoring the evidence: Each sub-theme is given a Red, Amber, Green (RAG) rating. A grey color block depicts that the rating is not applicable.

Table 1. Color classification of RAG rating

Internal data	Strong evidence	**External data**	Strong evidence
	Emerging evidence		Emerging evidence
	Mixed evidence		Mixed evidence
	Weak evidence		Weak evidence
	Not applicable		Not applicable

Internal quality control: in addition to the sense checking by Water.org, three discrete internal quality control steps have been taken: an internal workshop sharing the internal and external evidence to identify and discuss thematic findings and cross-cutting aspects; and 2 rounds of quality assurance of the report (draft and final).

Internal and external evidence: two icons are included in the text to denote whether a data source is internal to Water.org or external:

= internal evidence

= external evidence

1.4 Structure

The remainder of the report is structured as follows:

Section 2 provides a summary of findings.

Section 3 provides detailed findings for each of the sub-themes of (insert theme).

Section 4 provides a concluding statement.

Section 5 details the thematic Theory of Change (ToC).

Section 6 sets out a series of practical recommendations for consideration by Water.org.

References are then detailed.

2. Summary of findings

WaterCredit programs provide substantial economic value and boost household finances through several pathways.

WSS improvements provide considerable economic value and increase household finances.

Ex **WSS improvements have an economic value far surpassing the costs of ensuring universal access to WSS services.** Universal access to an improved water source would provide US$28.3 billion in economic value each year, while universal access to improved sanitation would deliver US$141.3 billion in economic value (WHO, 2012). Investing in WSS services is also highly cost-efficient, with benefit-cost ratios of 4.4. and 3.3 for investing in universal basic water and sanitation, respectively (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015).

In **WSS improvements financed through WaterCredit programs increase household finances.** 38% of WaterCredit customers report increased household income since their WSS improvement. Moreover, most Water.org evaluations detail a clear positive impact from WSS improvements on household finances. Of note:

1. In **Bangladesh**, a study that included a counterfactual[1] group of non-WSS loan recipient households found that households that availed water loans witnessed a 10% increase in household income compared to non-borrowers between baseline and endline (Water.org, 2018).
2. In **Cambodia**, the proportion of WSS loan recipients reporting month-to-month variations in household income in the past year decreased from 73% to 51% between baseline and endline (Causal Design; Water.org, 2020).
3. In **Indonesia**, a study that included a counterfactual group of non-WSS loan recipient households found that water improvement loans were not linked to increased household income but were associated with a 19% increase in expenditures (Barenberg, Konstantinidis, & Krause, 2019).
4. In **India**, the percentage of WaterCredit loan recipients earning over 3,000 rupees per month (equivalent to US$40.75) rose from 53% before the loan to 97% (World Bank & Water.org, 2015a).

A generally robust internal and external evidence base highlights how WSS improvements positively impact household finances through several pathways – time gains and indirect cost savings are the most significant of these.

Ex **The available internal and external evidence-base highlights five main pathways through which WSS improvements increase household finances.** To varying extents and based on differing levels of internal and external evidence, each of the five pathways investigated were found to increase household finances:

In

1. **Direct and Secondary Income Gains.** Water supply sources can be used for various direct and secondary income-generating activities;[2] however, secondary income gains are considerably more common. Sufficient and readily available water is required for water to be used for secondary income generation – once domestic water needs are met (approximately 20 liters per capita per day (LPCPD)), each additional LPCPD generates an estimated US$0.5-US$1 per year of income (Van Koppen, Moriaty, Smits, & Mikhail, 2009). Critically, the ability of WaterCredit programs to reach low-income, rural populations and result in access to a water supply source on premises means they are more likely to result in secondary income gains than conventional approaches to WASH programming. Moreover, WaterCredit programs have been shown to deliver secondary income gains – in Kenya, Uganda, and

[1] A counterfactual is where a study uses a comparison group of households (suitably similar to households which received the intervention) to establish what impact the intervention – in this case WaterCredit – beyond expected changes. In the context of WaterCredit, studies that used a counterfactual are considered a more robust measure of the impact of WaterCredit as they enable us to see if households which accessed WaterCredit experienced improved outcomes compared to other households. This allows us to understand the extent to which improvements – in access to water and sanitation, health, or other outcomes - can be attributed to WaterCredit rather than community- or nation-wide progress.

[2] Direct forms of income generation center on the sale of water. Secondary income gains result from forms of income generation that require a reliable, convenient, and sufficient supply of water (i.e., agriculture, small-scale enterprises).

Bangladesh, Water.org's internal evidence-base highlights that a considerable percentage of beneficiary households (30-59%) reported benefiting from direct or secondary income gains (Prime M2i Consulting, 2015; Water.org, 2018; Pories, 2015).

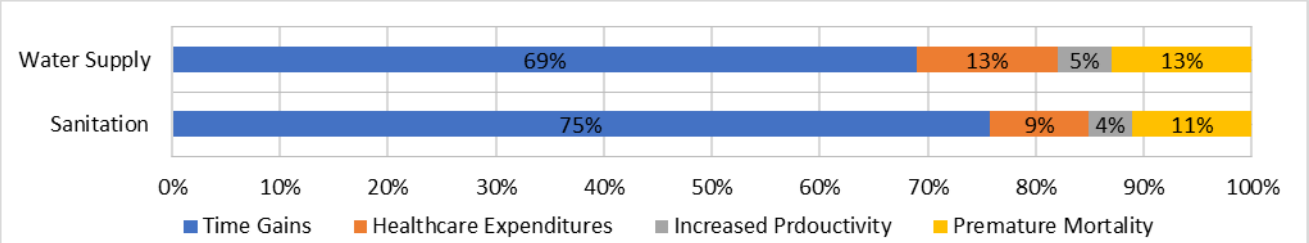
2. **Time Gains.** When households move up the drinking water and sanitation service ladders, considerable time gains occur. Substantial time savings also occur through WaterCredit programs. For example, Water.org's internal mWater data highlights that water supply improvements in Bangladesh, Brazil, Cambodia, India, and Indonesia are estimated to save the average household 44 minutes per day and 267 hours per year. Similarly, Water.org's internal mWater data also highlights that sanitation improvements in the same countries are estimated to save the average individual 14 minutes per day and 85 hours per year. For a five-person household, this equates to average savings of 425 hours per year. About 35-55% of time gains from WSS improvements are typically used for income-generating activities. Other external studies have estimated that universal access to safely managed water supply and services would result in an economic value of over US$1,000 billion globally from 2021-2040 through time savings for income-generating activities. Using the same basis for calculations as other global studies, water supply improvements from WaterCredit programs in Bangladesh, Cambodia, India, and Indonesia can be estimated to result in an additional household-wide economic value (assuming a five-person household) of US$60.00 per year because of time gains accessing their water supply source. On the same basis, WaterCredit programs in the same countries can be estimated to result in an additional average annual household-wide economic value of US$96.25 because of time gains for household members in accessing their sanitation facility.[3]
3. **Direct Cost Savings.** A wide range of factors influence tariffs and households' recurrent expenditures on WSS services and moving up the drinking water supply and sanitation service ladders often results in lower direct costs for households. For water supply, this reduction is most clearly evident when households shift from drinking water supply services supplied by small, comparatively informal private vendors – many poor households not connected to or accessing 'official' water points often pay far more than their fellow citizens. For sanitation, even in contexts where household sanitation facilities are comparatively expensive, long-term savings occur for households that invest in a toilet rather than paying for public toilets (WSUP, 2019). Water.org's moderate internal evidence-base on direct cost savings indicates that WaterCredit programs reduce households' expenditures on water supply services and (to a lesser extent) sanitation services (Stanford University, 2016; Causal Design; Water.org, 2020; Pories, 2015).
4. **Indirect Cost Savings.** WSS improvements provide considerable indirect cost savings. These primarily relate to the improved health outcomes associated with WSS improvements and cover savings related to seeking less healthcare, productive time losses from disease, and reductions in premature mortality. Universal access to improved WSS services is estimated to result in US$35.21 billion of economic value annually because of health-related indirect cost savings (WHO, 2012). WaterCredit programs have typically resulted in reduced medical expenditures for customers for WSS improvements. Of note, Water.org's internal evidence-base reports yearly household savings of US$34, US$48, and US$18 were reported in Kenya, India, and Bangladesh, respectively.
5. **Financial Inclusion.** Financial inclusion is a critical pillar in enabling poverty reduction and broader economic development, and micro-finance plays a critical role in increasing the financial inclusion of low-income households, rural populations, and women. Consulted Water.org program managers highlighted that they have limited internal data on key aspects related to financial inclusion as this is

[3] These figures are estimates, which have been made by pairing WaterCredit data with the same calculations used by prominent global studies on the economic value of WSS services (WHO, 2012). They represent an estimated average – there is an important degree of margin for error in these statistics and they do not reflect important nuances that exist both between and within countries. The following calculation was used for the estimate for adults (children in brackets): (i) annual GDP per capita (current US$) divided by average hours worked per year; (ii) multiply by 0.3 (0.15 for children) to provide 30% of GDP per capita (current US$) per hour worked (15% for children); (iii) multiply by annual time savings from the water supply or sanitation improvement to provide estimation for total annual adult (or child) economic value resulting from time savings from the water supply or sanitation improvement.

not an area most micro-finance institutions share data on. More information will be added in respect to Water.org following the analysis of the results for the Climate Change Partner Survey.

Ex **Of these pathways, time gains are the most significant way WSS improvements impact household finances, followed by health-related indirect cost savings.** The use of time gains for income-generating activities is consistently highlighted as the most impactful way WSS improvements impact household finances – this represents the primary way WaterCredit programs increase household income. Following this, health-related indirect cost savings resulting from WSS improvements are believed to have the greatest impact on household finances. Indeed, as Figure 1 details, global estimates on the economic value of WSS improvements calculate that 69% and 75% of the economic value of universal access to improved water supply and sanitation services respectively come from time gains (WHO, 2012).

Figure 2. Percentage contribution of time gains and health-related indirect cost savings to annual economic value of improved water supply and sanitation services (WHO, 2012)



There are varying levels of internal and external evidence supporting each of the five pathways detailed above. Table 1 uses a simple traffic-light system to summarize the robustness of each of the five pathways for increasing household finances investigated in this thematic paper, while key findings from the internal and external evidence bases are detailed throughout Section Three. It highlights the generally robust evidence-base for household finances, with higher scores here than for the other thematic areas.

Table 2. Robustness of the internal and external Data for the five pathways for WaterCredit programs increasing household finances

	Internal Data	External Data
Direct and Secondary Income Gains		
Time Gains		
Direct Cost Savings		
Indirect Cost Savings		
Financial Inclusion		

The one major exception here is for financial inclusion, with a limited internal and external evidence-base. To address this, Water.org should increase partner micro-finance institutions' reporting requirements on key aspects of financial inclusion such as:

1. Percentage of clients for WSS loans that are new clients.
2. Percentage of clients for WSS loans that do not have an available credit history.
3. Percentage of clients for WSS loans that go on to take out another product / loan.

Water.org has an important evidence-base on the impact of WaterCredit programs on household finances; however, important areas for improvement exist.

Recommendation: Make further minor refinements to the mWater Household Borrower Survey 3.0 to ensure the extent of the positive impacts of WaterCredit programs on household finances are captured. Water.org has developed an important and comparatively extensive evidence-base on the impact of WaterCredit programs on household finances through the five pathways detailed in this thematic paper. However, except for time gains, this data is largely not directly comparable across Water.org's focus countries.

In **Water.org has an important evidence-base relating to household finances; however, this is centralized on time gains.** Through comprehensive evaluations on WaterCredit programs and commissioning research studies, Water.org has developed a comparatively extensive internal evidence-base on the impact of WaterCredit programs on household finances. This covers current and historical Water.org focus countries and provides key information for four of the five pathways investigated for this thematic paper (direct and secondary income gains, time gains, direct cost savings, indirect cost savings). However, except for time gains, these issues are not focused on in Water.org's mWater 2.0 survey, and this information has not been collected in a systematic manner using comparable methodologies. This reduces the extent of the evidence for many of the pathways investigated and impedes the provision of a clear overall picture of WaterCredit programs' impact. Water.org's mWater 3.0 survey takes important steps to address this issue, with the series of new questions focused on important aspects of household finances not included in the mWater 2.0 survey addressing most of these challenges. Nevertheless, further comparatively minor modifications are warranted to the mWater Household Borrower survey 3.0 to ensure the extent of the positive impacts of WaterCredit programs on household finances are captured. The changes recommended in this regard are specified in detail in Section Five.

In **Cross-country datasets cover five predominantly Asian countries.** Cross-country datasets provide a useful top-level picture of WaterCredit programs' impact on household finances. However, for most key indicators relevant to household finances, this cross-country information is only available for Brazil, Bangladesh, Cambodia, India, and Indonesia. These largely represent the main countries where WaterCredit programs have resulted in the most WSS improvements. Nevertheless, Water.org has reached many people in Kenya (5.5 million), The Philippines (4.9 million), and Peru (3.1 million), but does not have cross-country data for these countries. This is especially important for Kenya as different – and more significant – impacts on household finances are expected in this context, which is less economically developed and more rural than Water.org's other main focus countries. Accordingly, Water.org should prioritize ensuring data collection on aspects related to the impact of WSS improvements on household finances in these countries.

In **Water.org's internal evidence-base on household finances is predominantly based on surveys conducted relatively recently after a WSS improvement is made (i.e., six to 18 months).** The various positive impacts of WSS improvements on household finances detailed in this thematic paper often take multiple years to occur and are likely not fully captured by endline evaluations conducted soon after a WSS improvement is made. Accordingly, Water.org should commission a multi-country study to investigate changes in household finances (and the pathways that have caused these changes) multiple years (i.e., two to five) after WSS improvements have been made to quantify key changes in this area over time.

In **Partner MFIs do not systematically provide Water.org with key data required on household finances.** Increased financial inclusion is an expected important 'added value' of Water.org's approach; however, limited information is available in this area. Water.org should expect partner MFIs to collect this information on an ongoing basis and to report it to Water.org.

3. Findings

3.1 Economic value and household income

WSS improvements have a considerable positive impact on economic development and household income.

Ex **WSS improvements have wide-ranging benefits that help to break the cycle of poverty and enable economic development.** Poor and vulnerable populations have lower access to basic WSS services. The economic losses associated with inadequate WSS services equate to 1.5% of global GDP and 4.3% of GDP in Sub-Saharan Africa, 2.9% in South Asia, 1.1% in Southeast Asia, and 0.9% in Latin America and the Caribbean (WHO, 2012). WSS improvements have wide-ranging benefits that make them crucial to breaking the cycle of poverty and enabling economic development. These benefits span aspects directly related to household finances (covered in this thematic paper) and elements more indirectly connected to household finances (i.e., improved health and education outcomes) (Hutton & Chase, 2017). Many studies have detailed the relationship between these

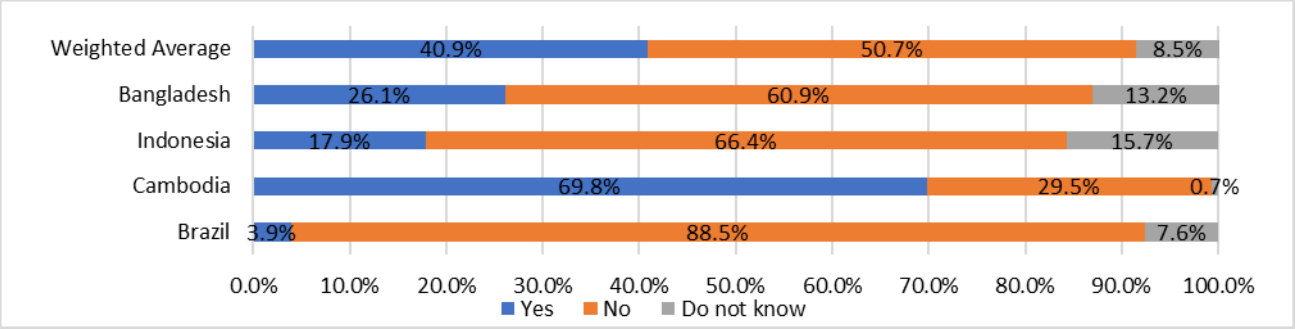
direct and indirect connections to household finances and economic development. For example, countries that reduced the prevalence of diseases and malnutrition have experienced accelerated GDP growth (WaterAid, 2021).

Ex **WSS improvements have an economic value far surpassing the costs of ensuring universal access to WSS services.** Universal access to an improved water source would provide US$28.3 billion in economic value each year, while universal access to improved sanitation would deliver US$141.3 billion in economic value (WHO, 2012). Investing in WSS services is also highly cost-efficient, with benefit-cost ratios of 4.4. and 3.3 for investing in universal basic water and sanitation, respectively (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015).

WaterCredit programs result in increased household income, especially in less economically developed contexts where a step change in WSS is often achieved.

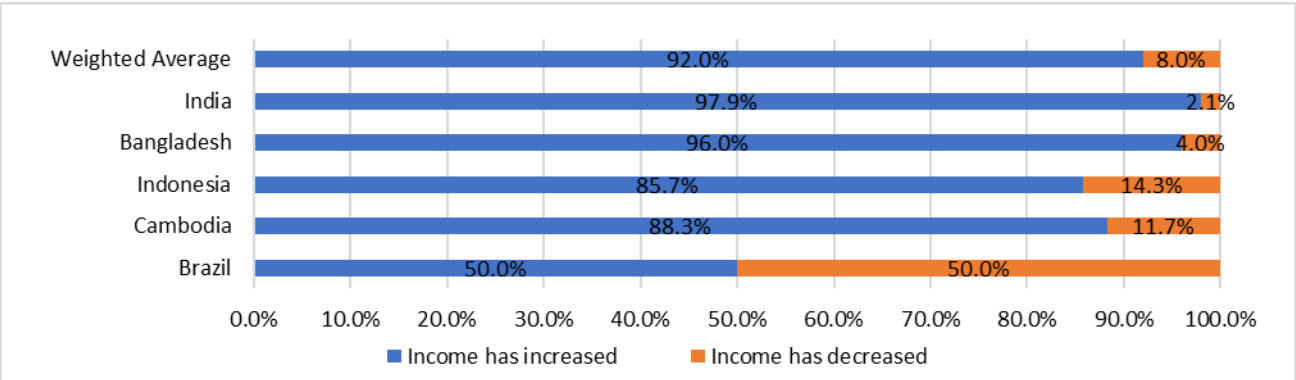
In **Thirty-eight percent of WaterCredit WSS loan recipients report that their WSS improvement increased household income.** As Figure 2 highlights, data from Water.org **internal mWater evidence-base** shows that 41% of surveyed WaterCredit customers' household income changed (positively or negatively) following the WSS improvement.[4]

Figure 3. Have you observed any changes in income since your improved water and / or sanitation improvement? (mWater survey 2.0, Water.org)



An overwhelming 92% of households that experienced a change in income following their WSS improvement reported increased household income (see Figure 3).

Figure 4. What change in income have you observed since your improved water and / or sanitation improvement? (mWater survey 2.0, Water.org)



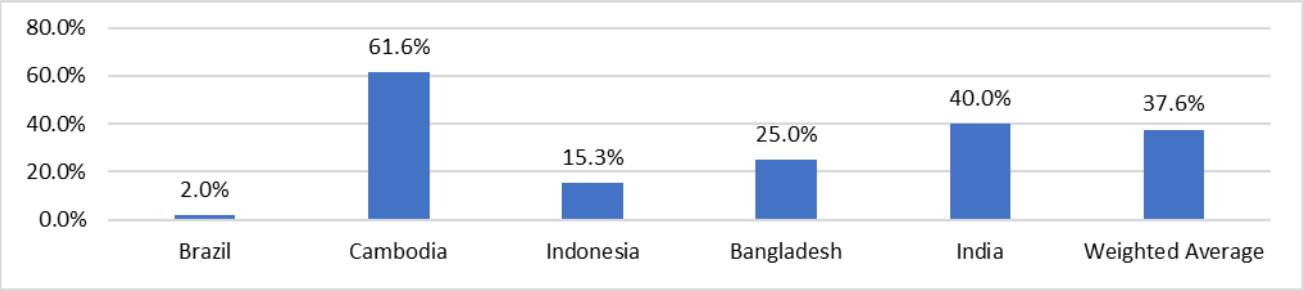
In Combining the data from the above graphs ascertains that 38% of WaterCredit customers' household income increased since their WSS improvement (see Figure 4).[5] More respondents experienced increased household

[4] This figures, and most of the figures in this report based on Water.org's internal evidence-base draws on data from Bangladesh, India, Indonesia, Cambodia, and Brazil – this is because these are the only countries where data is available from the mWater 2.0 survey on key indicators related to household finances.

[5] Additionally, in Kenya and Uganda, 35% of water loan recipients experienced 'enhanced income' (Prime M2i Consulting, 2015).

income in Bangladesh, Cambodia, and Indonesia (lower-middle-income countries) than Brazil (upper-middle-income). This could indicate that WaterCredit programs' impact on household finance may be greater in less economically developed contexts and where more significant progress is typically made up the drinking water and sanitation service ladders.

Figure 5. Percentage of WaterCredit customers reporting an increase in their household's income since their WSS improvement (mWater survey 2.0, Water.org)



In **Detailed Water.org evaluations provide a more mixed – albeit generally still positive – picture regarding the precise impact of WaterCredit programs on household finances.** The above information is based on large samples from Water.org's **internal mWater evidence-base** and provides a valuable top-level overview of households' perceptions of changes in income since their WSS improvement. WaterCredit evaluations provide a detailed breakdown of the extent of the changes that occurred for several focus countries:

1. In **Bangladesh**, a study that included a counterfactual of non-WSS loan recipient households found that households that availed water loans witnessed a 10% increase in household income compared to non-borrowers between baseline and endline, and 29% of households that availed water loans experienced considerable increases in their savings. A less significant impact occurred on the sanitation side, with households that took out a sanitation loan only benefitting from a 0.5% increase in their monthly household income (Water.org, 2018).
2. In **Cambodia**, the proportion of WSS loan recipients reporting month-to-month variations in household income in the past year decreased from 73% to 51% between baseline and endline of the WaterCredit program (Causal Design; Water.org, 2020).
3. In **Indonesia**, a study that included a counterfactual group of non-WSS loan recipient households found that WaterCredit loans for a water supply improvement were not linked to increased household income. However, they were associated with a statistically significant 19% increase in total expenditures (Barenberg, Konstantinidis, & Krause, 2019).
4. In **Peru** and **The Philippines**, a study that included a counterfactual of non-WSS loan recipient households found that WaterCredit programs did not have a discernable impact on households' monthly income or expenditures (Aguaconsult; Water.org, 2019).
5. In **India**, before taking out a WaterCredit loan, only 53% of borrowers made more than 3,000 rupees per month (equivalent to US$40.75); however, after the loan, this rose considerably to 97% (World Bank & Water.org, 2015a). A separate evaluation of a different WaterCredit program found substantially higher household incomes amongst WSS loan recipients than their pre-loan information. However, these differences were not statistically significant (Pories, 2015).

3.2 Direct and secondary income gains

Table 3. RAG rating for evidence of direct or secondary income gains

Internal data	▪ Water.org has not systematically collected evidence on the impact of WaterCredit programs on households' direct or secondary income gains, with just a small set of largely representative endline evaluations focusing on this area	**External data**	▪ Water supply sources can be used for various direct and secondary income generating activities; however, secondary income gains are considerably more common. ▪ Sufficient and readily available water is required for water to be used for secondary

	(Kenya and Uganda, Bangladesh, India, Indonesia). ▪ These endline evaluations highlight that most WaterCredit programs bring about notable secondary income gains. ▪ For water supply services, in Kenya, Uganda and Bangladesh, a considerable percentage of beneficiary households (30-59%) reported benefiting from direct or secondary income gains. Conversely, in India, only 0.7% reported selling water or otherwise using their new water supply facility or improvement for commercial purposes. ▪ Several features of WaterCredit mean it can be expected to result in greater secondary income gains than conventional WASH interventions.		income generation. Where only 20 liters per capita per day (LPCD) of water is readily, water will rarely be used for secondary income gains. ▪ Low-income and rural households benefit especially from secondary income gains from water supply services. This includes commercial and subsidence activities such as home gardens, livestock, and small-scale enterprises. ▪ Once domestic water needs are met (approximately 20 LPCD), each additional liter per capita per day generates an estimated US$0.5-US$1 per year of income. ▪ Improving water availability from 20-50 LPCPD to 50-100 LPCPD generates, on average, around US$50 per capita per year and roughly US$250 for a family of five.

Water supply improvements can be used for direct and secondary income gains if they provide larger quantities of readily available water than required for domestic purposes.

Ex **Water supply sources are used for a range of direct and secondary income gains.** As households access increased quantities of readily available water, they can use it for various direct and secondary income-generating activities. Direct forms of income generation center on the sale of water – for example, through setting up a licensed water vending point. Secondary income gains result from forms of income generation that require a reliable, convenient, and sufficient supply of water. This covers a broad set of income-generating activities, spanning commercial and subsidence agriculture and livestock as well as small-scale enterprises.

Ex **Water supply sources must be sufficient and readily available if they are to be used for income generation.** The quantity of water a household can access is an essential determining factor in the extent to which it can use a water supply source for secondary income-generating activities. When water availability exceeds 20 LPCPD it can start to be used for productive purposes alongside domestic ones (Van Koppen, Moriaty, Smits, & Mikhail, 2009):

1. *5-20 LPCPD*. Households will not have any spare water for productive uses after meeting their consumption needs.
2. *20-50 LPCPD*. Households can meet their consumption needs but still have limited excess water for domestic (i.e., laundry, cleaning) and productive uses.
3. *50-100 LPCPD*. Households have sufficient water for consumption, laundry, cleaning, and hygiene and cover water needs for a garden or small enterprise.
4. *100-200 LPCPD*. Households have sufficient water to meet their domestic needs and meet water requirements for a garden, livestock, and small enterprise.

Ex Households' ability to access higher quantities of water is closely associated with the labor required to bring water to its point of use for productive purposes (Van Koppen, Moriaty, Smits, & Mikhail, 2009). A household accessing water from a point source located 200 meters from their household will utilize considerably less water than one sourcing water from a household piped water connection, even if large quantities of water are theoretically available from the point source. This makes whether a household accesses their water supply source on their premises a crucial determining factor in the extent to which secondary income gains occur.

Water supply improvements can result in noteworthy secondary income gains.

Ex **Many households benefit from secondary income gains from water supply improvements, especially low-income households in rural contexts.** Only a limited proportion of households utilize water supply and

sanitation improvements for direct income gains. However, a much larger proportion of beneficiaries to water supply improvements utilize these improvements for secondary income-generating activities (i.e., agriculture, livestock, small-scale enterprises) if they are provided with a reliable and readily available water source that provides more water than the benchmark of 20 LPCPD for domestic purposes. This is especially true in rural and low-income contexts, where around 60-70% of households own livestock or have access to small cultivable plots, enabling them to benefit from the readily available access to larger quantities of water (i.e., above 20 LPCPD) (Hall, Van Houwelling, & Vance, 2014).[6]

Ex **The economic benefits of secondary income gains from water supply improvements can be considerable and increase as the quantities of readily available water rise.** Table 3 presents indicative estimates for average per capita annual secondary income gains when a household accesses different quantities of water.[7] Figures have been adjusted for inflation. It highlights that once domestic water needs are met (approximately 20 LPCPD), each additional LPCPD generates an estimated US$0.5-US$1 per year of income (BMGF, 2007). Accordingly, improving water availability from 20-50 LPCPD to 50-100 LPCPD generates, on average, around US$50 per capita per year and roughly US$250 for a family of five. Table 3 also highlights the greatest positive shift upwards from 20-50 LPCPD to 50-100 LPCPD, with the positive impact somewhat tapering off after this.

Table 4. Per capita annual income benefits per readily available quantities of water per productive uses (BMGF, 2007)

20-50 Liters	50-100 Liters	100-200 Liters
US$36.25	US$88.45	US$102.95

In **Several characteristics of WaterCredit programs mean that the use of water supply improvements for secondary income-generating purposes are likely to be higher than for more conventional programs providing funds for direct improvements in water and sanitation services.** Various factors influence whether a water supply source is more likely to be used for secondary income-generating purposes. These include whether they reach low-income and rural households, if water collection times are minimal, and if the quantities of water provided exceed requirements for basic domestic needs (i.e., drinking, cooking, hygiene, cleaning). Significantly, a considerable percentage of water supply improvements financed through WaterCredit programs meet these criteria, making it more likely that these facilities are used for secondary income-generating purposes than those constructed through more conventional WASH programs. Of note:

1. *Low-income households*. WaterCredit programs consistently reach low-income households – 25% of WaterCredit WSS loan recipients earn less than US$1.90 per day, 17% earn US$1.90-US$3.10, 31% earn US$3.10-US$6, and 27% earn over US$6.
2. *Rural households*. WaterCredit programs mainly reach rural households – 58% of WaterCredit WSS loan recipients have resided in rural areas, 25% in peri-urban contexts, and 17% in urban areas.
3. *Minimal collection times*. Water supply improvements financed by WaterCredit are almost exclusively provided on the loan recipients' property. More than 70% of loan recipients' water supply improvement is located in their dwelling, 26% in their own yard / plot, and just 3% elsewhere.
4. *Quantity of water*. Water.org has not collected data on the average quantities of water consumed per capita per day. However, water supply improvements made through WaterCredit financing are facilities that typically provide large quantities of water (i.e., household piped water connections), and 92% of WaterCredit water supply loan recipients are satisfied with the quantity of water provided by their improvement.

[6] In Senegal, for example, a household survey on domestic water use in Senegal found that 74% of the rural population reported using water to support their activities and that 49% of households generated an income from these productive activities. This productive income represented one-half of total household income for these activities. For the most part, households engaged in productive activities using water relied on water from piped water supply schemes (73%) (Hall, Van Houwelling, & Vance, 2014).

[7] Although basic domestic services generate a range of economic benefits, any income generated is through unplanned and often illegal water use, making sustainability uncertain – accordingly, benefits from services providing less than 20 liters of water per capita are not included.

WaterCredit customers are using water supply improvements for secondary income-generating activities. Water.org has comparatively limited internal evidence-base on the impact of WaterCredit programs on direct or secondary income gains. Three WaterCredit evaluations have investigated this area, highlighting the use of water supply improvements for secondary income-generating activities. Of note:

1. In **Kenya and Uganda**, a significant proportion of water facilities were used for commercial purposes, including water for agriculture and direct sales of water as a product – in total, 30% of water loan recipients used water for some form of commercial activity (Prime M2i Consulting, 2015).
2. In **Bangladesh**, 59% of households that availed WaterCredit loans reported utilizing water for income-generating purposes such as livestock, home gardening, and other micro-enterprise activities (Water.org, 2018).
3. In **India**, 0.7% of households that benefitted from a water supply improvement sold water or otherwise used their water supply improvement for commercial purposes (Pories, Income-Enabling, not Consumptive: Association of Household Socio-Economic Conditions with Safe Water and Sanitation, 2015).

The above-cited information highlights that some WaterCredit customers are using their water supply improvements for secondary income-generating activities. This, coupled with the external evidence-base and several characteristics of WaterCredit programs, means Water.org can claim WaterCredit programs result in secondary income gains. However, this is an area where further research is required to ascertain the extent of the positive impact (see Section Five).

3.3 Time gains

Table 5. RAG rating for evidence of time gains

Internal data	▪ Water.org has systematically collected data on WaterCredit programs' impact on time gains. This data highlights that WaterCredit has had a considerable positive impact on time gains. ▪ 54% and 61% of WaterCredit beneficiary households report that their WSS improvements have resulted in observable time gains, respectively for water compared to sanitation. ▪ Water supply improvements through WaterCredit programs in Bangladesh, Brazil, Cambodia, India, and Indonesia are estimated to save the average household 44 minutes per day and 267 hours and 40 minutes per year. ▪ Sanitation improvements through WaterCredit programs in Bangladesh, Brazil, Cambodia, India, and Indonesia are estimated to save the average individual 14 minutes per day and 85 hours and 10 minutes per year. ▪ Water.org has not systematically collected data on whether time gains are used for income-generating activities; however, this area has been investigated by several endline evaluations for WaterCredit programs in India. These provide statistically significant evidence of household members redirecting time previously spent accessing WSS services to income-generating activities, albeit with a high degree of	**External data**	▪ When households move up the drinking water supply ladder, considerable time gains occur. A rural household switching from an unimproved to improved source saves approximately 486 hours and 40 minutes per year. ▪ Substantial time gains also occur when an individual moves up the sanitation ladder. A rural individual that shifts from practicing open defecation to accessing a shared sanitation facility is estimated to save 91 hours and 15 minutes a year. ▪ Time gains for WSS improvements do not directly correlate with the increased performance of income-generating activities. A range of studies found that 35-55% of time savings are used for income-generating activities. ▪ Universal access to a safely managed water source would result in an economic value of US$342 billion globally from 2021-2040 through time savings for income-generating activities – nearly 70% of the total economic value of achieving universal safely managed water supply. ▪ Universal access to safely managed sanitation would result in US$660 billion of economic value from 2021-

	variance between WaterCredit programs (18-58%). Women benefit more than men from these time gains.		2040 through time savings for income-generating activities.

Significant time gains occur because of WSS improvements.

Ex **When households move up the drinking water service ladder, considerable time gains occur.** Table 5 presents estimations for the time an individual spends for a roundtrip collecting water from different levels of drinking water supply service (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015).[8] It highlights that noticeable reductions typically occur in the time that it takes to access a water supply service as a household moves from an unimproved source to an improved source to a household piped water connection. For example, there are time savings of around 40 minutes per roundtrip in rural areas when the level of service rises from an unimproved to improved source.

Table 6. Access time (roundtrip) for unimproved source, improved source, and household water connection (Hutton, 2015)

Variable	Access Time	
	Urban areas	Rural areas
Unimproved source	40 minutes (roundtrip)	60 minutes (roundtrip)
Improved source	20 minutes (roundtrip)	20 minutes (roundtrip)
Household piped water connection	Less than five minutes (roundtrip)	Less than five minutes (roundtrip)

Ex For water supply services, two roundtrips a day can be assumed per household to fulfill their needs for household water supply (minimum of 20 LPCPD) (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015). Table 6 utilizes this metric to calculate the annual time required to access different water supply service levels in urban and rural areas. These are household-wide, not individual figures. They highlight the considerable cumulative time spent accessing water supply services and the substantial time gains that occur by moving up the drinking water ladder. For example, a rural household shifting from an unimproved to an improved source will save just over 486 hours per year, while a rural household moving from an improved source to a household piped water connection will save just over 182 hours. Overall, providing universal, safely managed water supply services could save households 50 billion hours between 2021 and 2040 (WaterAid, 2021).

Table 7. Household-wide annual access time (roundtrip, 2 trips per day) for unimproved source, improved source and household water connection

Variable	Access Time	
	Urban areas	Rural areas
Unimproved source	486 hours and 40 minutes	730 hours
Improved source	243 hours 20 minutes	243 hours 20 minutes
Household piped water connection	60 hours 50 minutes	60 hours 50 minutes

Ex **Moving up the sanitation ladder results in substantial time savings.** Table 7 provides broad estimations for the amount of time individuals spend defecating in the open and using a shared sanitation facility in rural and urban areas (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015). It highlights less significant variations than for water supply services; however, these are individual rather than a household-wide calculations and result in comparable cumulative benefits. Of note, a rural household shifting from open defecation to shared sanitation would save roughly 15 minutes per instance accessing a sanitation service to defecate.

Table 8. Access time (roundtrip) for open defecation and shared sanitation (Hutton, 2015)

	Access Time

[8] These top-level estimations for time savings from Hutton 2015 for water supply improvements are supported by a range of other studies (Rosen & Vincent, 1999; Blackden & Wodon, 2006; Koolwal & Van de Walle, 2010; Sorenson, Morssink, & Campos, 2011; Gross, Gunther, & Schipper, 2013; IPSOS, 2018; United Nations Women, 2014).

Variable	Urban areas	Rural areas
Open defecation	15 minutes travel time roundtrip	20 minutes travel time roundtrip
Shared sanitation	5 minutes travel and waiting time roundtrip	5 minutes travel and waiting time roundtrip

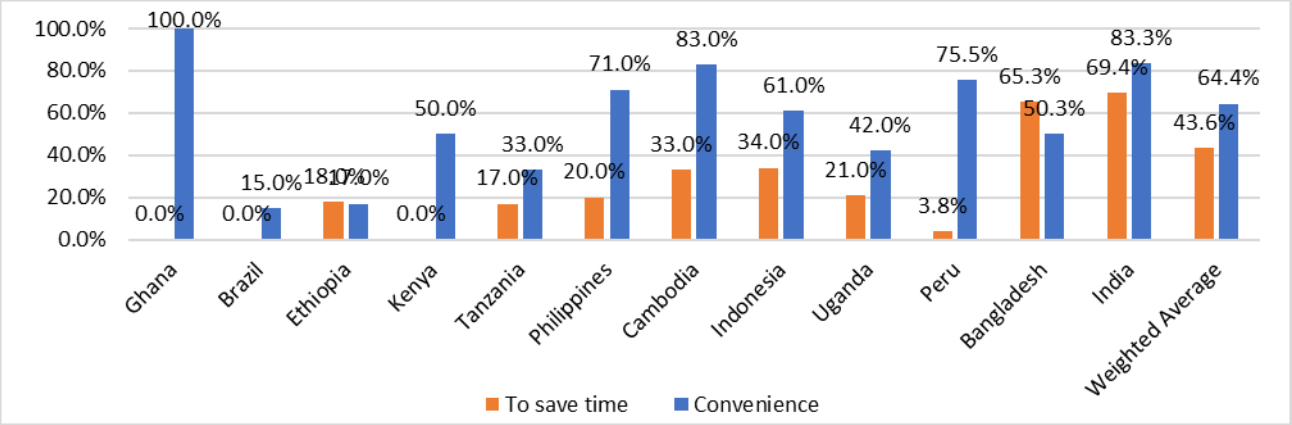
Ex One trip to a sanitation facility for defecation can be assumed per day (Hutton, Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda, 2015). Table 8 uses this figure to calculate the amount of time individuals use to defecate over the course of a year. This highlights noteworthy differences between open defecation and accessing a shared sanitation service. A rural individual saves 91 hours and 15 minutes a year by shifting from open defecation to shared sanitation. Further benefits would occur when an individual shifts to a basic or safely managed service. This is less than the figure for water supply; however, this is calculated on an individual rather than a household-wide basis – moving up the sanitation service ladder saves less time per trip than moving up the drinking water ladder but benefits considerably more people. Overall, from 2021-2040, universal access to safely managed sanitation could save more than 43 billion hours (WaterAid, 2021).

Table 9. Individual annual access time (roundtrip, 1 trip per day) for open defecation and shared sanitation

Variable	Access Time	
	Urban areas	**Rural areas**
Open defecation	91 hours and 15 minutes	121 hours and 40 minutes
Shared sanitation	30 hours 25 minutes	30 hours 25 minutes

In **Time gains are an important driver for WaterCredit customers to finance a WSS improvement.** Water.org internal evidence-base shows that across 12 historical and current Water.org focus countries, time savings and convenience are consistently primary drivers for WaterCredit customers to finance their WSS improvement. Indeed, as Figure 5 details, time savings (44% weighted average) and convenience (63%) were primary drivers for a considerable proportion of beneficiary households improving their WSS service.

Figure 6. Primary time gain-related drivers for WSS improvements (mWater survey 2.0, Water.org)



In **An estimated 54% of WaterCredit customers have experienced observable time gains for household members from their water supply improvement.** As Figure 6 details, Water.org's internal evidence-base shows that 59% of WaterCredit customers for a water supply improvement from Bangladesh, Cambodia, India, Indonesia, and Brazil observed a change (positive or negative) in the amount of time their household spends collecting water since the improvement. Of this 59%, an overwhelming majority (92%) report that their new water supply improvement resulted in household members spending less time collecting water (see Figure 7).

Figure 7. Since your new water improvement, have you observed any changes in the amount of time that you or other household members spend collecting water? (mWater survey 2.0, Water.org)

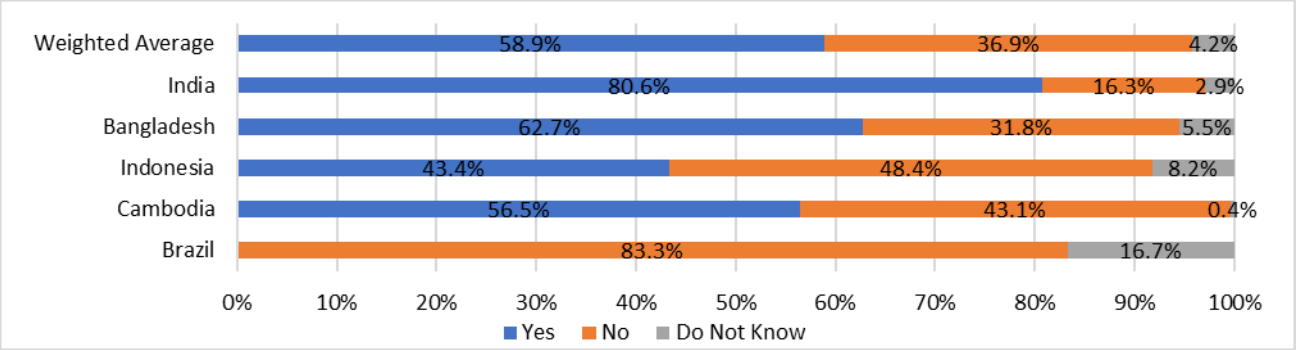
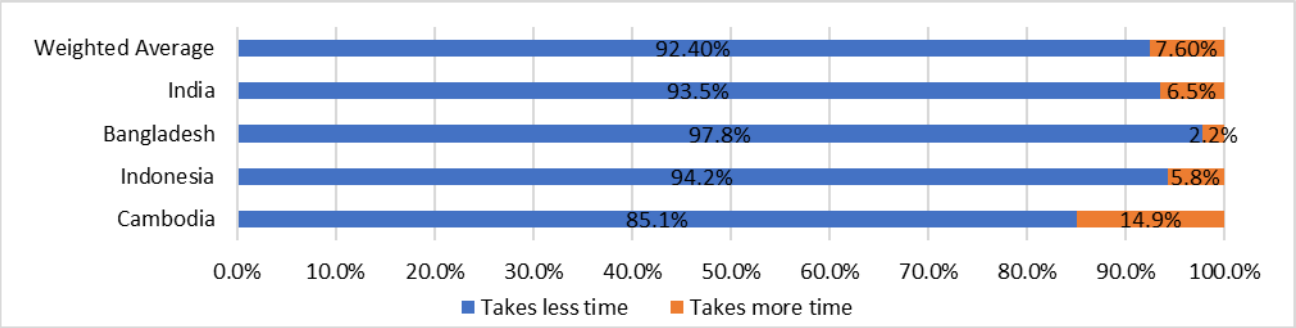
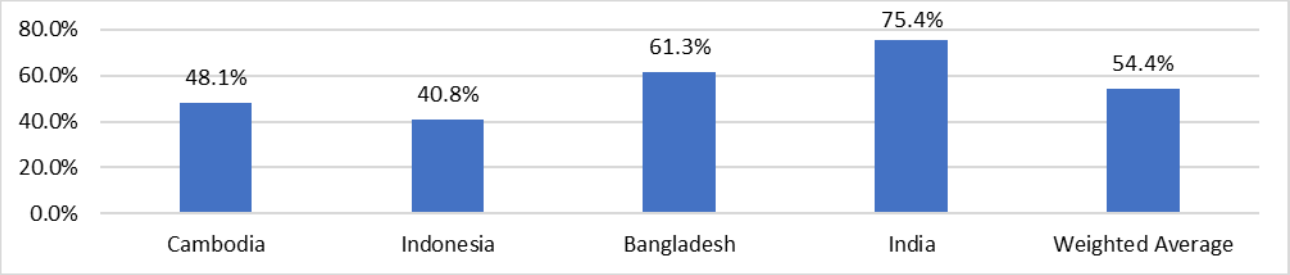


Figure 8. What changes have you observed since your new water improvement? (mWater survey 2.0, Water.org)



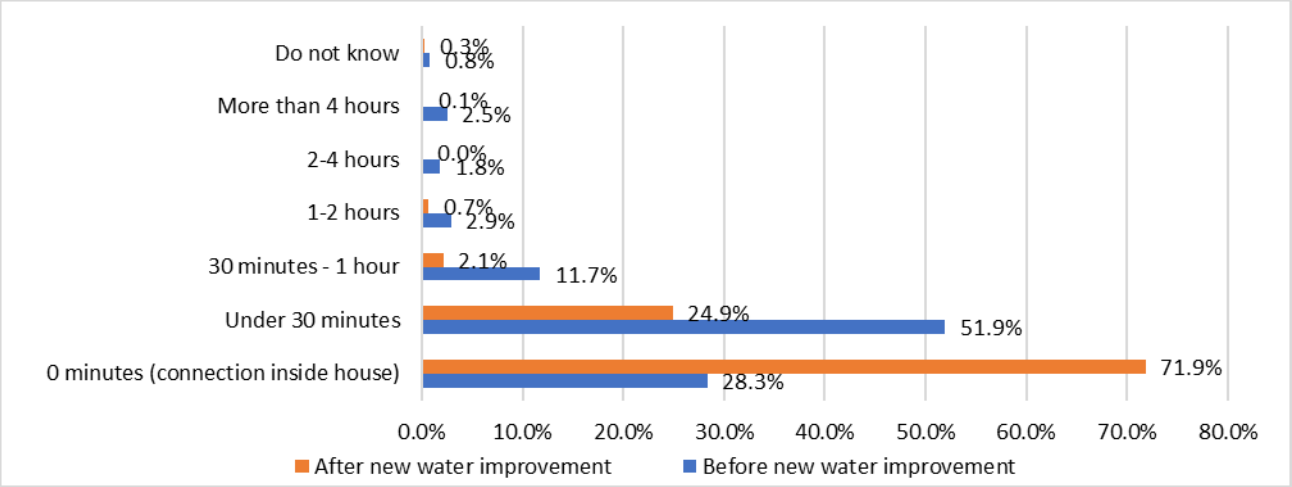
As Figure 8 details, combining the data from the above graphs highlights that a weighted average of 54% of WaterCredit customers that financed a water supply improvement reported that it reduced the time household members take collecting water.

Figure 9. Percentage of WaterCredit customers reporting that their water supply improvement resulted in a reduction in the amount of time spent by household members collecting water (mWater survey 2.0, Water.org)



In More specifically, as Figure 9 highlights, Water.org's internal evidence-base shows WaterCredit customers from Bangladesh, Brazil, Cambodia, India, and Indonesia experienced a considerable reduction in the time household members spend collecting water from their primary water source. Of note, with the considerably higher percentage of households accessing water on their premises (28% to 72%), a considerable reduction is evident in the percentage of households taking both over 30 minutes to collect water (19% to 3%) and taking one to 30 minutes (52% to 25%). In addition to this, a study that included a counterfactual of non-WSS loan recipient households found that in Kenya, water supply improvements financed through WaterCredit resulted in average time savings of 122 hours per year per household (Stanford University, 2016).

Figure 10. Time spent collecting water from primary water source (walking to source, waiting, collecting water, returning home) (mWater survey 2.0, Water.org)



In **Water supply improvements financed through WaterCredit programs in Bangladesh, Brazil, Cambodia, India, and Indonesia can be estimated to have saved the average household 44 minutes per day and 267 hours and 40 minutes per year**. This is calculated based on two trips per household per day to meet a households' water needs (minimum of 20 LPCPD).

In **Sixty-one percent of WaterCredit customers' sanitation improvement has resulted in observable time gains for household members.** As Figure 10 highlights, Water.org's internal evidence-base shows that a weighted average of 65% of households with a sanitation improvement observed a time gain in accessing a sanitation service. Of these, 94% reported that the sanitation improvement resulted in a reduction in the amount of time household members spent accessing their sanitation service (see Figure 11).

Figure 11. Since your improved sanitation facility, have you observed any changes in the time it takes to access the facility? (mWater survey 2.0, Water.org)

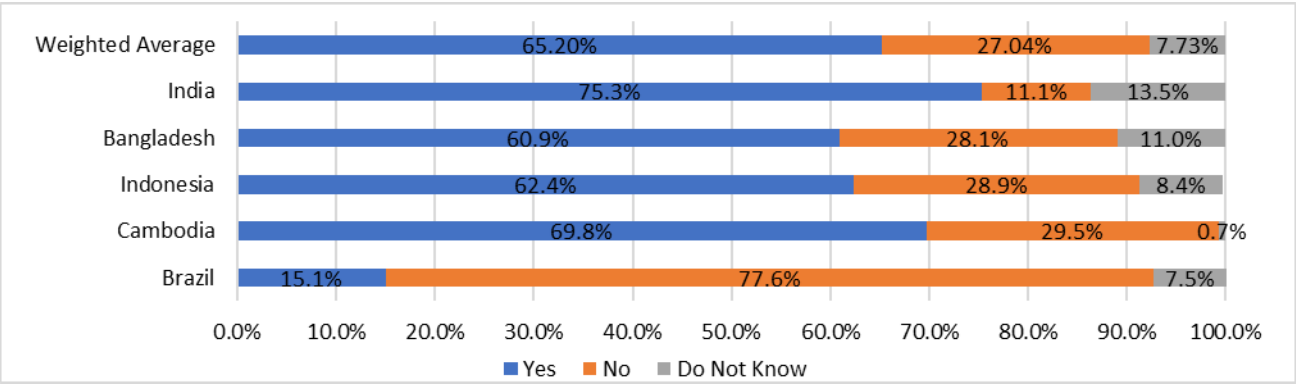
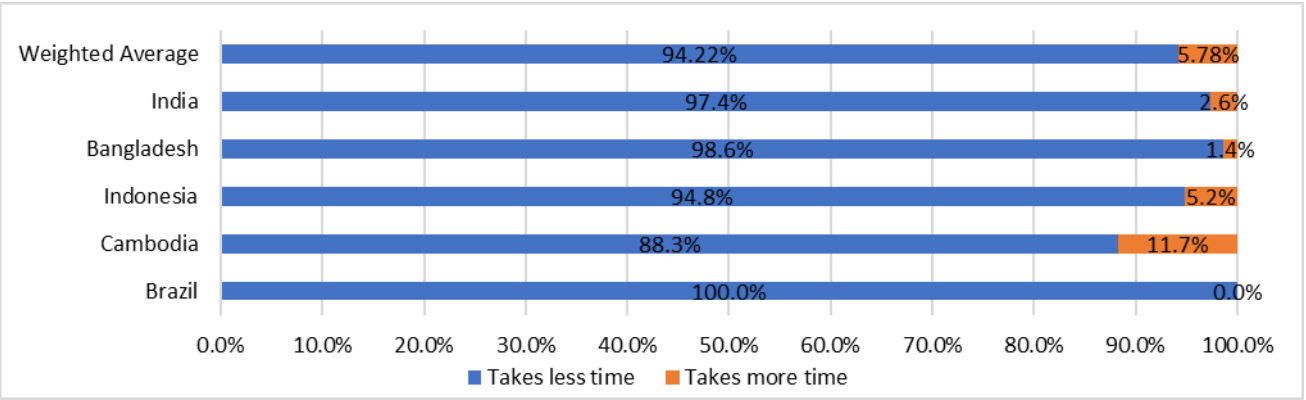
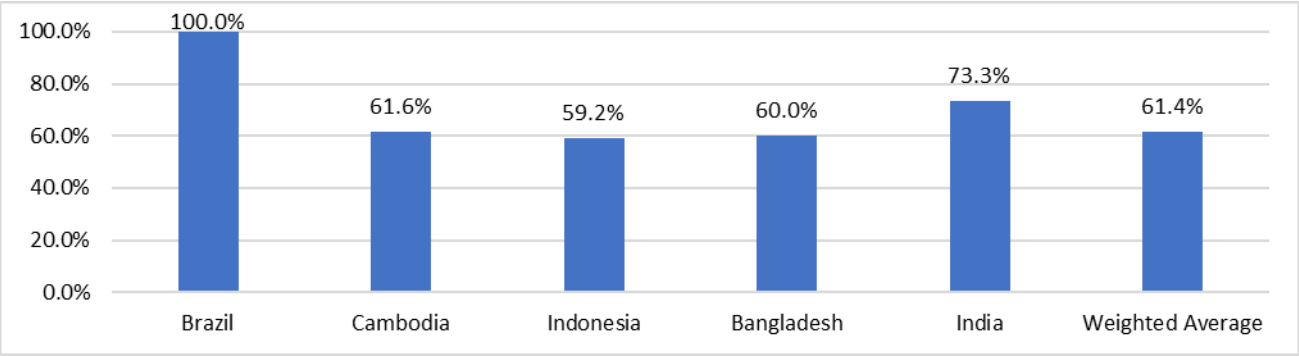


Figure 12. What changes have you observed since your new sanitation improvement? (mWater survey 2.0, Water.org)



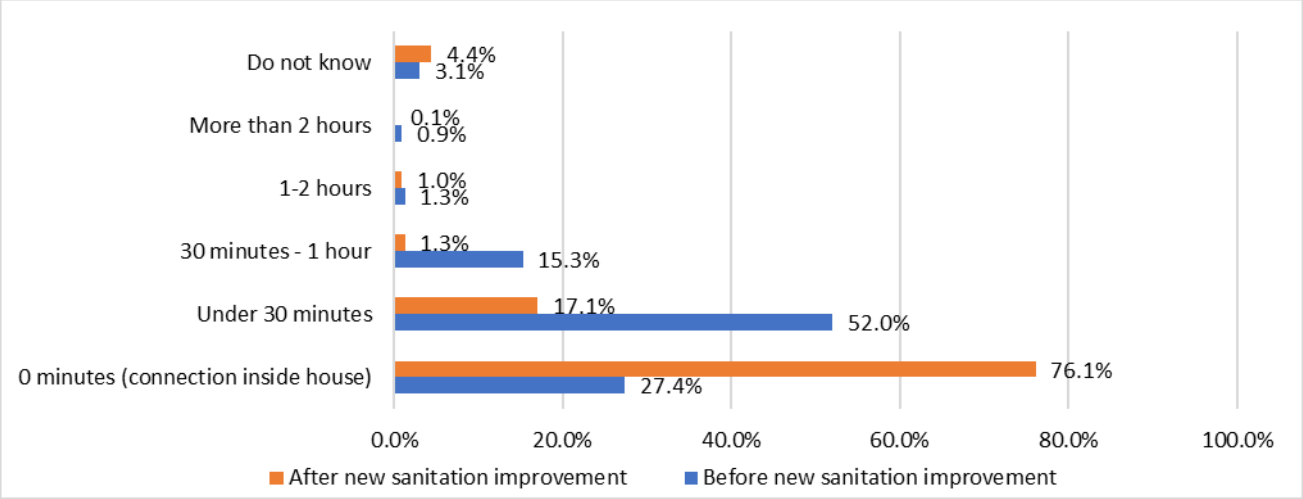
In Figure 12 is based on Water.org internal mWater data. It provides a top-level summary of the percentage of households reporting that they observed a reduction in the time household members spend accessing a sanitation service since the improvement was made. Ultimately, it highlights that 61% of WaterCredit customers with a sanitation improvement observed a reduction in household members' time accessing a sanitation service.

Figure 13. Percentage of beneficiary households reporting that their sanitation improvement has resulted in a reduction in the amount of time spent by household members accessing a sanitation service (mWater survey 2.0, Water.org)



In More specifically, Figure 13 highlights that WaterCredit programs in Bangladesh, Brazil, Cambodia, India, and Indonesia have considerably reduced the time household members spend accessing their sanitation service. In particular, the percentage of respondents accessing a sanitation facility inside their home increased considerably (27% to 76%), causing both the percentage of household members taking more than 30 minutes (18% to 2%) and one to 30 minutes (52% to 17%) to drop considerably.

Figure 14. Time spent accessing primary sanitation facility (mWater survey 2.0, Water.org)



In **Sanitation improvements financed through WaterCredit programs across Bangladesh, Brazil, Cambodia, India, and Indonesia are estimated to have saved the average individual household member 14 minutes per day and 85 hours and 10 minutes per year.** This is based on Water.org **internal evidence-base** and assumes an individual makes one trip per day to a sanitation facility for defecation. This results in household-wide savings of 1 hour and 10 minutes per day and 425 hours and 50 minutes per year.

Time gains accessing WSS services positively impact household finances.

Ex **Time gains from WSS improvements increase household finances; however, the positive economic impact varies.** Opportunities to perform income-generating activities depend on many factors that extend well beyond nearby access to WSS services (United Nations Foundation, 2014; IPSOS, 2018; Ray, 2007). Moreover, how a household or individual uses time savings is ultimately their personal choice. Consequently, significant variations exist in the use of time gains for income-generating activities in different contexts. Time savings are not exclusively used for income-generating activities, with time previously spent collecting water rarely

correlating precisely with the subsequent engagement in productive activities (Koolwal & Van de Walle, 2010). Nevertheless, a considerable proportion of time savings are frequently used for income-generating activities, with studies often finding that 35%-55% of time savings are used for productive purposes. Of note:

1. Across Nigeria, Eswatini, and Rwanda, 39% of women that saved time on water supply collection used saved time on income generation, with 81% expanding income-generating activities and 22% starting a new income-generating activity (IPSOS, 2018).
2. In Benin, 35% of women used time gains for income-generating activities such as agriculture, trading, or handicrafts (Gross, Gunther, & Schipper, 2013).
3. In Ghana, daily time savings of five hours for women in collecting water resulted in an extra two hours per day being directed to income-generating activities (farming and trading). Women's time savings also freed up men to conduct an additional two hours of income-generating activities (Arku, 2010).
4. In Kyrgyzstan, 53% of time savings were used for farm labor (additional 1 hour 30 minutes) and 47% for leisure activities (additional 1 hour 20 minutes) (Meeks, 2017).

While not detailed here, time gains not directly used for income-generating activities are far from redundant and represent a further important impact from WSS improvements (OCED, 2011).

Ex In **Using time gains for economically productive activities represents the largest way WSS improvements impact household finances and economic development.** Universal access to safely managed water sources would result in US$342 billion in economic value globally (2021-2040) through using time savings for income-generating activities, accounting for nearly 70% of the economic value of achieving universal safely managed services (WaterAid, 2021). The considerably larger percentage of households without a safely managed sanitation service and the wider benefits of sanitation services to all household members means that the use of time gains from universal access to safely managed accounts for US$660 billion in economic value between 2021 and 2040 (WaterAid, 2021).[9]

Water.org's comparatively limited internal evidence-base on the use of time gains for income-generating activities highlights a clear positive impact on household finances. Relevant information has only been collected as part of a couple of endline evaluations from India. While limited in its breadth, this evidence-base highlights a clear positive impact of WaterCredit programs, as follows:

- Across three WaterCredit programs in India, a household member re-directed time formerly used for water collection to income-generating activities because of time gains in 21% of households with a water supply improvement. Of these, women (62%) were more likely than men (38%) to become economically active (Pories, 2015).
- Across the same three WaterCredit programs, in 58% of households with a new sanitation improvement, a household member re-directed time formerly dedicated to defecation towards income-generating activities (Pories, 2015).
- Eighteen percent of WaterCredit customers from a 2008-2011 WaterCredit program implemented across five Indian States increased their household income because of having more productive days because of time gains. Moreover, from the same program, 23% of households increased their household income due to the extra time available for women (NRMC; Water.org, 2014).

In **Water supply and sanitation improvements financed through WaterCredit programs can be estimated to result in important increases in economic value.** Inputting WaterCredit data on the time savings resulting from WSS improvements in Bangladesh, Cambodia, India, and Indonesia with the calculations used by prominent global studies on the economic value of WSS services enables an estimation of the economic value

[9] These top-level global calculations are supported by further, more specific country-level studies highlighting the positive impact of time gains in increasing household finances through enabling the greater performance of income-generating activities. For example, in India, the opportunity costs of reduced time lost from sickness and seeking a place for open defecation were calculated 24,646 rupees (equivalent to US$356) per household per year.

of the time gains resulting from these improvements. More specifically, the following calculations have been made:[10]

I. Water supply improvements in Bangladesh, Cambodia, India, and Indonesia financed through WaterCredit programs can be estimated to result in an average annual economic value of US$17.25 and US$8.50 resulting from the time savings incurred for adults and children, respectively. For a household of five (two adults, three children), this equates to an average annual economic value of US$60.00 resulting from time savings in accessing their primary water supply source.

II. Sanitation improvements in Bangladesh, Cambodia, India, and Indonesia financed through WaterCredit programs can be estimated to result in an average annual economic value of US$27.50 and US$13.75 resulting from the time savings incurred for adults and children, respectively. For a household of five (two adults, three children), this equates to an average annual economic value of US$96.25 resulting from time savings in accessing their sanitation service.

There is good level of confidence that WaterCredit programs have a positive impact on household finances through this pathway. This is because of the robust internal and external evidence base on time gains from WSS improvements and the external evidence-base on the use of time gains for income-generating activities. **Indeed, this pathway should be seen as the main way WaterCredit programs impact household finances.**

3.4 Direct cost savings

Table 10. RAG rating for evidence of direct cost savings

Internal data	▪ Water.org has a limited robust evidence-base for the impact of WaterCredit programs on direct cost savings, with only three endline evaluations from India, Kenya, and Cambodia investigating this area. ▪ This moderate evidence-base indicates that WaterCredit programs reduce households' expenditures on water supply services and (to a lesser extent) sanitation services.	**External data**	▪ The capital and recurrent costs of drinking water supply and sanitation facilities increase as you move towards more complicated facilities that are associated with higher service levels. ▪ A wide range of factors influence service providers tariffs for WSS services. ▪ A shift away from informal private vendors usually reduces the costs of drinking water supply services. ▪ Even in contexts where household sanitation facilities are comparatively expensive, long-term savings occur for households that invest in a toilet rather than paying for public toilets.

Improved WSS services are more costly to construct and maintain; however, costs do not fall onto one household

Ex **Higher service levels may imply higher capital and recurrent costs, especially for networked services.** Table 10 details annualized capital and recurrent expenditure benchmarks for water services based on life-cycle cost analysis from India, Burkina Faso, Ghana, and Mozambique. These costs do not directly relate to the water tariffs charged to households, with many factors impacting service providers' water tariffs. However, Table 10 highlights how small through to large, piped water supply facilities are typically more expensive to construct (total capital expenditure) and run on a recurrent basis (recurrent expenditure = operation and maintenance

[10] These figures are estimates, which have been made by pairing WaterCredit data with the same calculations used by prominent global studies on the economic value of WSS services (WHO, 2012). They represent an estimated average – there is an important degree of margin for error in these statistics and they do not reflect important nuances that exist both between and within countries. The following calculation was used for the estimate for adults (children in brackets): (i) annual GDP per capita (current US$) divided by average hours worked per year; (ii) multiply by 0.3 (0.15 for children) to provide 30% of GDP per capita (current US$) per hour worked (15% for children); (iii) multiply by annual time savings from the water supply or sanitation improvement to provide estimation for total annual adult (or child) economic value resulting from time savings from the water supply or sanitation improvement.

expenditure, capital maintenance expenditure, expenditure of direct support) than boreholes fitted with hand pumps (Burr & Fonseca, 2013).

Table 11. Annualized capital and recurrent expenditure benchmarks for water services (Burr & Fonseca, 2013)

	Cost Ranges (min-max) in US$ 2011 per person, per year		
	Borehole and Handpump	**Small and Medium Piped Water Supply Schemes (serving 1-5,000)**	**Intermediate and Large Piped Water Supply Schemes (serving over 5,000 people)**
Total Capital Expenditure	US$20-US$61	US$30-US$131	US$20-US152
Operational & Maintenance Expenditure	US$0.5-US$1	US$0.5-US$5	US$0.5-US$5
Capital Maintenance Expenditure	US$1.5-US$2	US$1.5-US$7	US$1.5-US$7
Expenditure on Direct Support	US$1-US$3	US$1-US$3	US$1-US$3
Total Recurrent Expenditure	**US$3-US$6**	**US$3-US$15**	**US$3-US$15**

Ex **Offsite (sewered) sanitation services have higher capital and operational costs across the sanitation service chain than onsite (non-sewered) sanitation services.** There is a dearth of reliable cost data for rural and urban sanitation (Sainati, Zakaria, Locatelli, & Sleigh, 2020). Nevertheless, Table 11 details the total annualized cost per household by system element and for the whole system of four common improved sanitation facilities. While far from directly reflective of the tariffs charged, there are considerably higher annualized per household costs for sewerage systems (US$783) than onsite 'septic' tanks (US$158, and as low as US$128 in Africa).

Table 12. Annualized cost per household by system element and for whole system (Sainati, Zakaria, Locatelli, & Sleigh, 2020)

Archetypal Sanitation System	**Containment**	**Emptying**	**Transport**	**Treatment**	**Whole System**
Container-based sanitation, with mechanized emptying and transfer stations, with composting (aerobic treatment)	US$115	US$83		US$17	**US$215**
Onsite 'septic' tanks, mechanized emptying and transport with anaerobic treatment	US$87	US$28		US$44	**US$159**
Onsite 'septic' tanks, mechanized emptying and transport with anaerobic treatment (Africa only)	US$87	US$30		US$11	**US$128**
Sewerage, conventional, combined, pumped, with activated sludge treatment	US$362	US$287		US$134	**US$783**

Ex The costs of constructing and maintaining these WSS facilities do not necessarily fall as one household's responsibility. In many countries, governments bear the responsibility of capital investments of networked services, with households typically only responsible for paying their connections to water and sanitation systems. Where households have been using and paying for public toilets, constructing an individual toilet may result in cost savings on the long-term (WSUP, 2019).

WSS improvements often result in reduced tariffs and expenditures on these services for households following upfront capital costs.

Ex **Reduction in household expenditures occur particularly when there is a shift away from informal private vendors.** When households shift from drinking water supply services supplied by small, comparatively informal private vendors, a reduction in households' typical direct expenditures on drinking water supply sources occurs. Indeed, while it is often assumed that the poorest people in the world do not have formal water supplies because they cannot afford the bills, many poor households not connected to or accessing 'official' water points often pay far more than their fellow citizens. As Table 12 details, while water costs should not exceed three percent of household income (United Nations, 2014), the cost of 50 liters of water from informal private operators frequently equates to a considerable portion of a typical low daily salary in the given context.

Most facilities managed by communities, local governments, public and corporatized utilities, and formalized private operators meet this benchmark of three percent, and the exorbitant costs detailed in Table 12 often force households to access unimproved water sources.

Table 13. Costs of sourcing drinking water requirements from informal private operators

City	Country	Service / Service Provider	Cost of 50 Liters of Water	Percentage of a Typical Low Daily Salary
Koh Tom	Cambodia	Water Vendor (Bottled Water)	£1.75	108%
Port Moresby	Papua New Guinea	Water Delivery Service	£1.84	54%
Antananarivo	Madagascar	Tanker Truck	£0.50	45%
Accra	Ghana	Tanker Truck	£0.45	25%
Leku Keta	Ethiopia	Street Vendor	£0.10	15%
Maputo	Mozambique	Street Vendor	£0.09	13%
Ouagadougou	Burkina Faso	Street Vendor	£0.08	9%
Lusaka	Zambia	Street Vendor	£0.09	4%
London	United Kingdom	Official Piped Supply	£0.07	0.1%

Ex **Even in contexts where household sanitation facilities are comparatively expensive, long-term savings occur for households that invest in a toilet rather than paying for public toilets.** In Kumasi, Ghana, public toilets charge GH₵ 0.3-0.5 (equivalent to US$0.05-0.08), costing an average family of five more than GH₵ 900 each year (US$150) (WSUP, 2019). Although household sanitation facilities are relatively expensive in Kumasi (anything from US$200-1,000), most households would cover the costs of an average sanitation facility (about US$380) in less than three years through savings on the costs of using public sanitation facilities (WSUP, 2019).

In **WaterCredit programs appear to usually result in direct cost savings for borrowers for sanitation and (especially) water supply improvements.** However, Water.org has a comparatively limited internal evidence-base on this area, having not systematically collected data on households' expenditures on accessing WSS services before and after WaterCredit programs. Accordingly, no comparable data is available in this area. Nevertheless, this is an area that a few WaterCredit evaluations have focused on, generally highlighting the moderate positive impact of sanitation and (especially) water supply improvements on households' expenditures on these services. Of note:

1. In **Kenya**, a study that included a counterfactual of non-WSS loan recipient households found that household spending for water supply in the previous week was US$1.23 for WaterCredit households compared to US$1.77 for comparison households (Stanford University, 2016), indicating a yearly saving of US$22.88 per household. Additionally, not considering loan payments for or revenues from neighbors using a household's toilets, the average per capita costs for a private toilet are roughly 10 times lower than off-plot options (Stanford University, 2016).
2. In **Cambodia**, a study that included a counterfactual of non-WSS loan recipient households found that availing a WaterCredit loan was associated with a 12% decrease in the likelihood that a given household is paying a water tariff (Causal Design; Water.org, 2020).
3. In **India**, 37% of households with a water supply improvement asserted that savings on water-related expenses resulted in economic benefits to the family; however, only 2% of respondents with a sanitation improvement reported that they accrued financial savings on sanitation-related expenses (Pories, 2015).

In A wide range of factors impact the regular expenditures and tariffs that households make for accessing WSS services. The available external and internal evidence-base highlights that direct cost savings do often occur when households shift away from accessing WSS services through private water vendors and public sanitation facilities. In this respect, Water.org can claim that WaterCredit programs often result in direct cost savings. However, at the same time, there is insufficient evidence for Water.org to report direct cost savings for

Ex

households that shift from accessing community managed facilities to those managed by private operators, public or corporatized utilities, and local governments.

3.5 Indirect cost savings

Table 14. RAG rating for evidence of indirect cost savings

Internal data	▪ WaterCredit programs have consistently resulted in reduced medical expenditures for WSS loan recipients. Of note, yearly household savings of US$34, US$48, and US$18 were reported in Kenya, India, and Bangladesh, respectively. ▪ Water.org has not systematically collected information on the impact of WaterCredit programs on other important health-related indirect cost savings (i.e., reduced productive time losses from disease and reductions in premature mortality). ▪ WaterCredit programs' positive impact on WSS loan recipients' health means that a positive impact on household finances through the indirect cost savings of productive time losses and premature mortality can be inferred.	**External data**	▪ WSS improvements provide considerable indirect cost savings. These savings primarily relate to the improved health outcomes associated with WSS improvements and cover savings related to seeking less healthcare, productive time losses from disease, and reductions in premature mortality. ▪ Following time gains, indirect cost savings related to health are the most significant pathway through which WSS improvements increase household finances. Consequently, they have been projected to have substantial economic value. ▪ Universal access to an improved water supply service is estimated to result in US$8.09 billion of economic value annually because of health-related indirect cost savings. ▪ Universal access to improved sanitation is estimated to result in US$27.12 billion of economic value annually as a result of health-related indirect cost savings.

WSS improvements bring about several significant indirect cost savings.

Ex **WSS improvements result in health-related indirect cost savings for households.** Access to improved WSS services results in a range of indirect cost savings, primarily related to the improved health outcomes associated with the expanded provision of WSS services. Of note, there are three primary – and commonly cited – cost savings related to health impacts (Hutton, 2015; WHO, 2001):

1. *Savings related to seeking less healthcare*. Households facing prolonged and short-term health issues associated with unimproved WSS services often allocate a considerable percentage of their limited disposable income to medical expenditures.
2. *Savings related to productive time losses from disease*. Healthier workers are physically and mentally more energetic and robust, more productive, and earn higher wages. They lead to greater overall economic development, and they are also less likely to be absent from work due to illness (or illness in their family). The effect is especially strong in developing countries, where a higher proportion of the workforce is engaged in manual labor.
3. *Savings related to reductions in premature mortality*. Premature loss of life has substantial indirect impacts on household finances that far exceed the income that would be earned, with a life year valued at around three times annual earnings. Accordingly, avoiding premature loss of life because of health impacts from WSS improvements has a considerable economic benefit.

Ex **Health-related indirect cost savings provide considerable economic value.** The annual value of indirect cost-savings related to health from WSS improvements are substantial – following time gains, these are the most significant way WSS improvements impact household finances and overall economic development. The contribution of health-related benefits equates to 31% of the benefits for water supply, with reduced healthcare expenditure and premature mortality accounting for 13% of this, and increased productivity accounting for 5% (WHO, 2012). For sanitation, health-related benefits account for 25% of the total economic benefit – reduced premature mortality equates for 11% of this, reduced healthcare expenditures 9%, and increased productivity 4% (WHO, 2012). Table 14 details the total annual health-related economic benefits of

achieving universal access to improved WSS services, which total US$35.21 billion (US$8.09 billion for water, US$27.12 billion for sanitation).

Table 15. Annual health-related economic value of achieving universal access to improved WSS services (WHO, 2012)

	Universal Improved Water Supply Service	Universal Improved Sanitation Service	Total
Reduced Healthcare Expenditures	US$3.5 billion	US$11.5 billion	**US$15 billion**
Reduced Premature Mortality	US$2.8 billion	US$9.1 billion	**US$11.9 billion**
Increased Productivity	US$1.79 billion	US$6.52 billion	**US$8.31 billion**
Total	**US$8.09 billion**	**US$27.12 billion**	**US$35.21 billion**

WaterCredit programs reduce households' medical expenditures; however, there is insufficient internal Water.org data on other important health-related indirect cost savings.

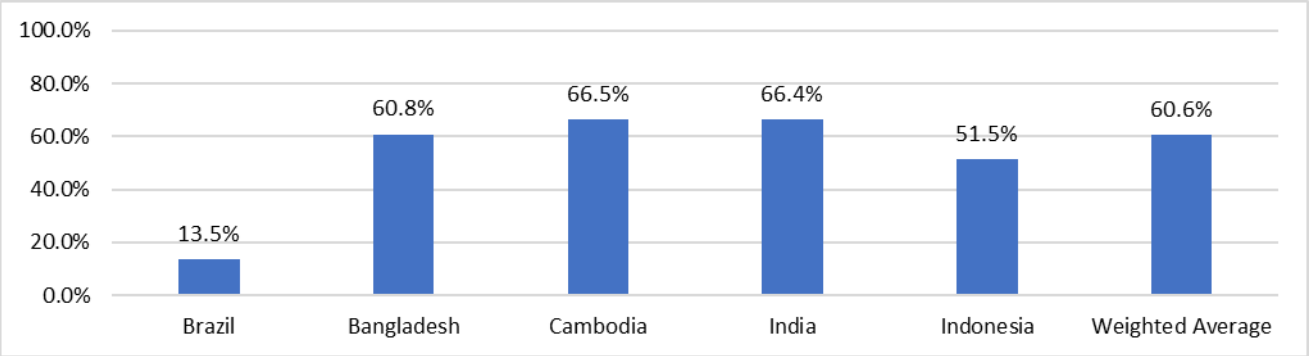
In **WaterCredit programs consistently reduce borrower households' expenditures on medical costs.** Comparable cross-country data is not available on the impact of WaterCredit programs on households' medical expenditures. Nevertheless, this is an area investigated by several evaluations, typically highlighting a clear positive impact from WaterCredit programs. Of note:

1. In **India**, 18% of WaterCredit borrowers reported reduced medical expenses (World Bank & Water.org, 2015a).
2. In **Kenya**, a study that included a counterfactual of non-WSS loan recipient households found that household spending on care for respiratory and diarrheal illness in the two weeks before the survey was US$1.56 for WaterCredit households compared to US$2.21 for comparison households (Stanford University, 2016).
3. In **Bangladesh**, households that availed WaterCredit water loans witnessed a reduction of BDT 129 (equivalent to US$1.52) in monthly health-related expenditures (Water.org, 2018), equating to savings of US$18.24 per household per year.

In **Water.org does not have any data explicitly looking at the health-related indirect costs savings of productivity gains and reduced premature mortality.** Evaluations of WaterCredit programs that have investigated the indirect cost savings resulting from WSS improvements have consistently only done this from the perspective of households' medical expenditures. Consequently, the extent of other potential – and often significant – indirect cost savings such as savings related to productive time losses from disease and reductions in premature mortality are not captured.

In **Water.org has investigated WaterCredit programs' impact on WSS loan recipients' health, enabling a positive impact on other health-related indirect cost savings to be inferred.** Figure 14 presents the percentage of WaterCredit customers from Brazil, Bangladesh, Cambodia, India, and Indonesia that observed improvements in their family's health following their WSS improvement. This highlights that 60% of WaterCredit customers experienced improved family health following their WSS improvement. Given this, and other indications of improved health outcomes from WSS improvements (see thematic paper on health and safety), WaterCredit programs can be assumed to positively impact the health-related indirect cost savings of reduced premature mortality and productive time losses.

Figure 15. Percentage of WSS loan recipients that observed improved health outcomes following their WSS improvement



Despite internal evidence only explicitly focusing on the health-related indirect cost savings of reduced medical expenditures, Water.org can claim that WSS improvements financed through WaterCredit programs positively impact household finances through the pathway of health-related indirect cost savings. This is because of the extensive and robust external literature on the three main health-related indirect cost savings resulting from WSS improvements as well as Water.org's internal data on WaterCredit programs' impact on WSS loan recipients' health.

3.6 Financial inclusion

Table 16. RAG rating for evidence of financial inclusion

Internal data	▪ Water.org's approach of working through partner micro-finance institutions is believed to increase financial inclusion through the same pathways as micro-finance generally. ▪ However, insufficient data is available to gauge the extent of the impact of WaterCredit programs on financial inclusion.	**External data**	▪ Financial inclusion is a critical pillar in enabling poverty reduction and broader economic development. ▪ Micro-finance plays a critical role in increasing financial inclusion, especially for low-income households, rural populations and women not served or targeted by the formal banking sector. ▪ There is, however, a lack of external evidence on the role of WSS lending is enhancing financial inclusion.

Financial inclusion is vital to enabling poverty reduction, and microfinance plays a critical role in increasing the financial inclusion of low-income households and rural populations.

Ex **Financial inclusion is central to poverty reduction and economic development, but many low-income and rural households remain excluded from the financial ecosystem.** Financial inclusion refers to "whether individuals and businesses have access to useful and affordable financial products and services that meet their needs" (World Bank, 2021). It facilitates day-to-day living and is a central pillar of poverty reduction – for example, access to formal sector credit is crucial to enabling households to take advantage of economic opportunities to increase their productivity and boost income levels (Shetty, 2008). Access to financial services such as credit, savings, and insurance is as necessary for low-income households as it is for the affluent and middle-class (Chakrabarti & Kaushiki, 2015). However, many financial institutions' reluctance to grant credit Ex to low-income households or operate in remote contexts has prevented many households' financial inclusion.[11]

Microfinance addresses supply- and demand-side barriers that often prevent low-income households, rural populations, and women from entering the financial ecosystem. Microfinance provides financial services to low-income (usually) women who lack access to conventional banking and related services. It can improve their welfare by enabling access to small loans that alleviate the capital constraints that often prevent low-

[11] Thirty-one percent of adults globally do not have an account, with higher a proportion for women, low-income groups, and those residing in rural areas (World Bank, 2021).

income households' economic development. Critically, microfinance has several features that make it effective in addressing supply- and demand-side barriers:

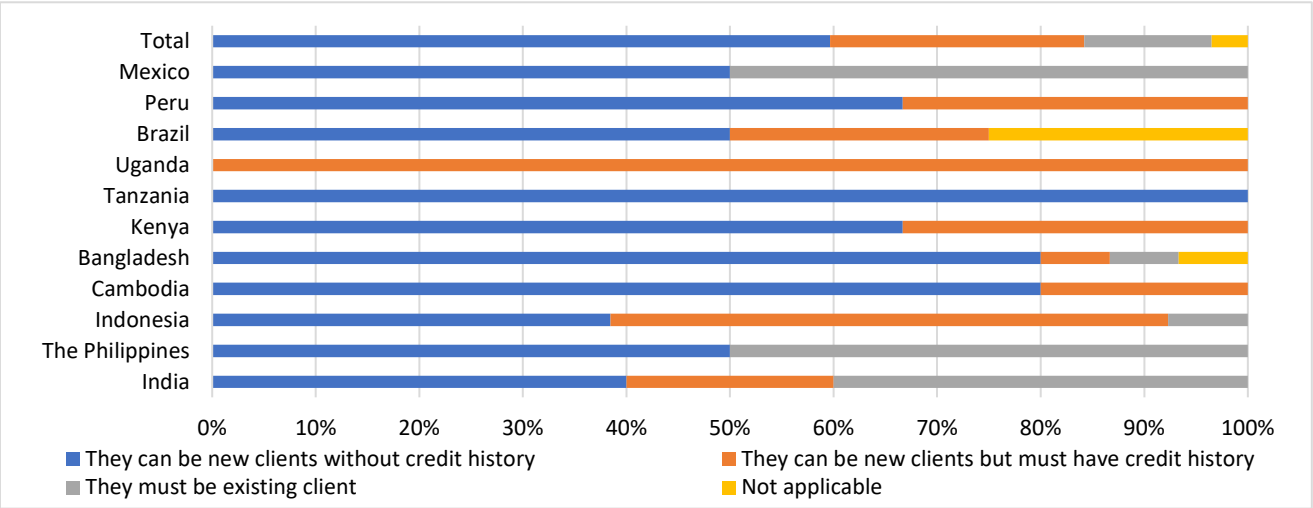
1. Supply-side features of microfinance include tailoring financial products to low-income groups' requirements (i.e., rarely insisting on collateral, small and frequent loan repayments), providing convenient forms of financial service delivery (i.e., visiting customers' neighborhoods), and limited documentation requirements (Shankar, 2013).
2. Demand-side factors addressed by micro-finance include cultural and psychological barriers and lack of financial literacy and competence, with basic training on financial concepts by local loan officers playing an important role (Shankar, 2013).

Ex **Microfinance plays a critical role in increasing financial inclusion, especially for low-income households and rural populations.** Microfinance products such as credit encourage more people and groups to be included in the financial ecosystem, providing these individuals and groups with the possibility to also access other financial services such as savings, financial education, and insurance (Adeola & Evans, 2017). In turn, this results in greater access to resources (credit, training, loans, capital), exposure to group support, accumulation of social capital, and reduction in vulnerability to private borrowing (Gopalaswamy, Babu, & Dash, 2015), all of which are crucial to financial inclusion. Several studies highlight positive impact of micro-finance on financial inclusion (Adeola & Evans, 2017; Chakrabarti & Kaushiki, 2015; Shetty, 2008), and it has played an especially critical role in accelerating the financial inclusion of low-income and rural households and women.

In **Water.org's approach of working through partner micro-finance institutions is believed to increase financial inclusion.** Through its WaterCredit programs, Water.org pre-dominantly partners with micro-finance institutions to deliver financial services orientated around WSS improvements to low-income households. These partner micro-finance institutions' WSS loans can be expected to play a key role in increasing financial inclusion as they bring households into the financial ecosystem and provide these households with the opportunity to subsequently also access other financial services. Crucially, these loans predominantly go to rural, low-income households and are mainly taken out by women – these are all groups that are more likely to not be properly integrated into the financial ecosystem.

In **Insufficient data is available to gauge the extent of the impact of WaterCredit programs on financial inclusion.** While WaterCredit programs can be expected to increase financial inclusion, it is not possible to determine the extent of the positive impact in this area. Three key variables can be projected to impact the extent to which micro-finance loans impact financial inclusion: (i) whether the loan recipient has previously taken out a loan with a micro-finance institution; (ii) whether the loan recipient has an available credit history; and (iii) whether the loan recipient goes on to take out another product or loan with the micro-finance institution. Significantly, Water.org does not currently collect this information from its partner micro-finance institutions, and this represents an important area to begin tracking (see Section Five). Nevertheless, as part of a recently conducted Partner Climate Change Survey, Water.org's partner MFIs were asked whether their organization allow new clients to take out a WSS loan, or if they needed to be an existing client? Figure 16 presents the results from this question. This highlights that most Water.org MFI partners enable new clients to take out a water or sanitation loan (84%). Even more significantly, 60% of Water.org MFIs enable new client to take out water and sanitation loans and do not require these individuals to have a credit history. This compares to just 12% of Water.org partner MFIs that require water and sanitation loan recipients to be existing customers. Further information is required on this area before definitive conclusions can be drawn. However, these statistics are an important initial indication that WaterCredit programs help to bring low-income households into the financial ecosystem. This is a potential key area where WaterCredit programs have an important and unique 'added value'.

Figure 16. Does your organization allow new clients to take out a water or sanitation loan, or do they need to be existing clients? (Climate Change Partner Survey, Water.org)



4. Concluding statement

Water.org has developed an important evidence-base relating to household finances; however, further improvements are warranted. Through its ongoing monitoring and evaluation activities of WaterCredit programs, Water.org has developed a comparatively extensive evidence-base on the impact of WaterCredit programs on household finances. This is especially true for the critical issue of time gains. When coupled with the external literature, this internal evidence-base enables Water.org to confidently state that WaterCredit programs are positively impacting household finances through several pathways. Nevertheless, improvements are still warranted, and the following three recommendations are offered to Water.org to further improve its internal evidence-base on this key topic: (see section 6).

5. Theory of Change

The below diagram depicts the Theory of Change (ToC) for the household finances theme that was co-constructed by the research team and Water.org together during the ToC workshop. The ToC builds from the foundational outcomes (blue boxes) up to the theme-related outcomes (purple boxes + other colors from other themes). The ToC shows how change is expected to occur both in regard to the WC (blue arrows) and WASH contributions (black arrows). It also maps out the linkages between related outcomes, the level of impact associated with these connections, and the strength of evidence associated with each outcome, as explored in the report (please see the key for further detail).

Figure 16. Key for the ToC

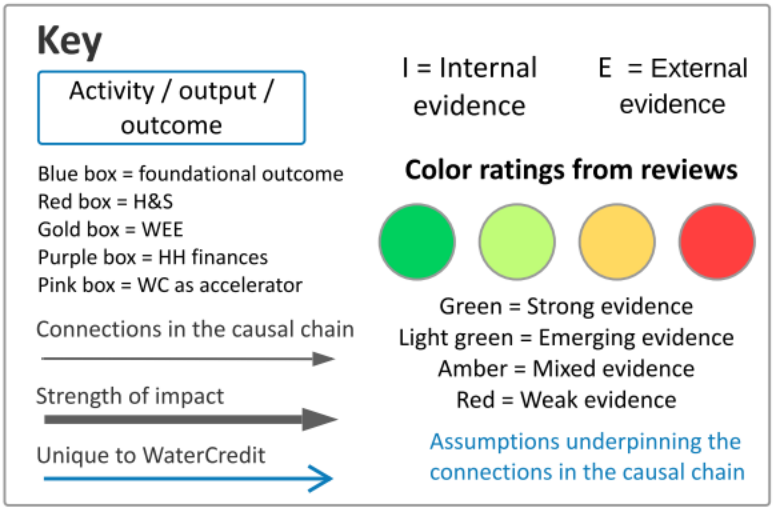
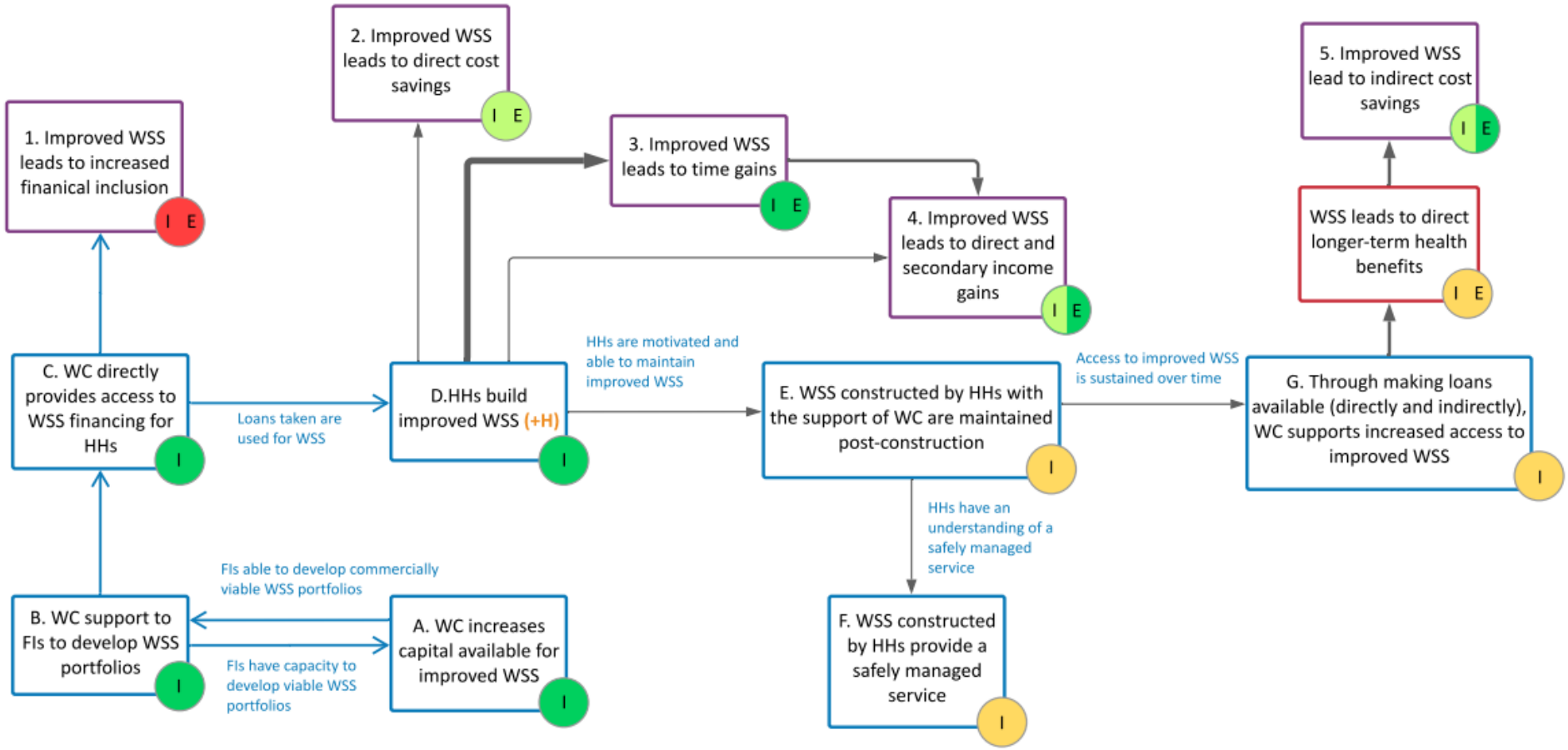


Figure 17. ToC co-constructed for the household finances theme



6. Recommendations

Make further refinements to surveys to ensure the extent of the positive impacts of WSS microfinance programs on household finances are captured. Water.org has developed an important and comparatively extensive evidence-base on the impact of WaterCredit programs on household finances through the five pathways detailed in this thematic paper. However, except for time gains, this data is largely not directly comparable across Water.org's focus countries. To better understand the impact of WSS microfinance programs on household finances, a more robust, cross-country comparable evidence-base should be gathered on the five main pathways. A key area for improvement is to ensure that the extent of the positive impact of WaterCredit programs, or any WSS microfinance program, on households are captured rather than simply noting that a positive change is occurring. Finally, data collection should be more geographically representative, and span beyond the data already collected for Brazil, Bangladesh, Cambodia, India, and Indonesia.

Evaluate the impact of WSS microfinance programs on household finances multiple years after the programs end. The various positive impacts of WSS improvements on household finances detailed in this thematic paper often take multiple years to occur and are likely not fully captured by endline evaluations conducted within a year of a WSS microfinance program ending. To fully capture impact, a multi-country study should be undertaken to investigate changes in household finances (and the pathways that have caused these changes) multiple years (i.e., two to five) after WSS improvements have been made to quantify key changes in this area over time. Other areas such as health and safety, women's empowerment and equity, and education where the impact of WSS improvements varies over time would also warrant investigation two to five years after the WSS improvement was made. However, depending on the resources available, this study may need to be selective in its focus to enable the researchers to provide sufficient detail on the changes that have occurred.

Increase partner micro-finance institutions' reporting requirements on key aspects of financial inclusion. The accelerated financial inclusion of WSS loan recipients is an important potential added value of WSS microfinance programs. However, there is currently has comparatively limited data on this area. Accordingly, reporting and data collection requirements placed on its partner micro-finance institutions should be expanded to include the following areas:

1. Percentage of clients for WSS loans that are new clients.
2. Percentage of clients for WSS loans that do not have an available credit history.
3. Percentage of clients for WSS loans that go on to take out another product / loan.

To further maximize impact in this area, consider financial incentives (i.e., larger loans, marginally more advantageous interest rates) to partner micro-finance institutions to offering WSS loans to new clients or clients that do not have an available credit history. Programs could also require partner micro-finance institutions to agree to set targets regarding the percentage of WSS loans provided to new clients.

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