

Monitoring Safely Managed Water and Sanitation Services

Case Studies from Water for Women



About Water for Women

Water for Women supports improved health, gender equality and wellbeing in Asian and Pacific communities through socially inclusive, sustainable and resilient water, sanitation and hygiene (WASH) projects and research. It is the Australian Government's flagship WASH program, delivered as part of Australia's aid program, investing AUD 118.9 million over five years from 2018 to 2022. Water for Women is partnering with civil society organisations and research organisations to deliver 33 projects in 15 countries to support socially inclusive and sustainable WASH projects and research. Knowledge and learning are central to Water for Women and its partners, positioning the Fund as an important contributor to global knowledge development and sharing in inclusive WASH. Water for Women's Learning Agenda promotes collaboration and learning between all partners to support long-term changes to inclusive and resilient WASH policy and practice.

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Front cover: Community facilitators testing water quality during Community-based Water Security Improvement Planning facilitation, Solomon Islands. Photo by Dr Regina Souter, International WaterCentre, Griffith University.

Abbreviations

ADP	Alternating Dual Pit
CBT	Compartmental Bag Test
CFAR	Centre for Advocacy and Research, India
CFM	Child Faeces Management
CSO	Civil Society Organisation
DCE	Discrete Choice Experiment
DDA	District Development Authority
DHIS2	Druk Health Information System (Bhutan)
<i>E. coli</i>	<i>Escherichia coli</i>
FSM	Faecal Sludge Management
HfH	Habitat for Humanity
HHS	Household Survey
IWC	International WaterCentre, Griffith University
JMP	Joint Monitoring Programme for Water Supply and Sanitation
Lao PDR	Lao People's Democratic Republic
LLG	Local Level Government
MIS	Management Information System
MoH	Ministry of Health, Bhutan
ODF	Open Defecation Free
OH&S	Occupational Health and Safety
PaCWaM+	Pacific Community Water Management Plus Project (International WaterCentre)
PHED	Public Health Engineering Division (Bhutan)
PNG	Papua New Guinea
PoC	Point of Collection
PoU	Point of Use
PPE	Personal Protective Equipment
RSAHP	Rural Sanitation and Hygiene Programme (Bhutan)
Safe CFM	Promoting Safe Child Faeces Management Project (International WaterCentre)
SDG	Sustainable Development Goal
SINU	Solomon Islands National University
SMS	Safely Managed Sanitation
SMSU	Sanitation Marketing Scale-Up Program (iDE Cambodia)
SNV	SNV Netherlands Development Organisation
SSH4A	Sustainable Sanitation and Hygiene for All (SNV)
UN-Water	United Nations Water
UNICEF	United Nations Children's Fund
UTS-ISF	University of Technology Sydney, Institute for Sustainable Futures
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

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Introduction to the Case Study Collection

The goal of the Australian Government’s Water for Women Fund (hereafter referred to as ‘Water for Women’) is improved health, gender equality and well-being of Asian and Pacific communities through inclusive and sustainable water, sanitation and hygiene (WASH). This aligns with the United Nations Sustainable Development Goal (SDG) 6, which aims to *‘ensure availability and sustainable management of water and sanitation for all’*. This target is measured in access to the highest service level of ‘safely managed’ water and sanitation. The concept of ‘safely managed’ services goes beyond provision of access to improved sources and facilities, requiring consideration of the quality and comprehensiveness of services to ensure public health and environmental outcomes.

To monitor global progress towards SDG6, the World Health Organization (WHO) / United Nations Children’s Fund (UNICEF) Joint Monitoring Programme (JMP) has defined ladders for safely managed water and sanitation services to produce comparable national estimates (Table 1). The safely managed service level is assessed for SDG targets 6.1² and 6.2³, with rates of open defecation also tracked for the sanitation target. While there continues to be progress in monitoring safely managed services, from the latest JMP data in 2020, estimates for safely managed water supply were not available for three regions and large gaps remain in monitoring of on-site sanitation (not sewerred services).¹ The monitoring required for assessment against these targets adds to the complexity of the household surveys traditionally used to measure access to water and sanitation services. This is particularly true for assessing water quality, containment type and the emptying and treatment of excreta from on-site sanitation systems.

Table 1. JMP ladder for drinking water (left) and sanitation (right)¹.

6.1 ² SERVICE LEVELS	DEFINITION	6.2 ³ SERVICE LEVELS	DEFINITION
SAFELY MANAGED	Drinking water from an improved source that is: <ul style="list-style-type: none"> • Accessible on premises: located within the dwelling, yard or plot • Available when needed: sufficient water available or at least 12 hours per day • Free from contamination: compliant with standards for faecal and priority chemical contamination 	SAFELY MANAGED	Use of improved facilities that are not shared with other households, and with: <ul style="list-style-type: none"> • Wastewater treated off site; • Excreta treated and disposed in situ; or • Excreta emptied and treated offsite.
BASIC	Drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing	BASIC	Use of improved facilities that are not shared with other households
LIMITED	Drinking water from an improved source, for which collection time exceeds 30 minutes for a round trip, including queuing	LIMITED	Use of improved facilities that are shared with other households
UNIMPROVED	Drinking water from an unprotected dug well or unprotected spring	UNIMPROVED	Use of pit latrines without a slab or platform, hanging latrines or bucket latrines
SURFACE WATER	Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation canal	OPEN DEFECACTION	Disposal of human faeces in fields, forests, bushes, open bodies of water, beaches or other open places, or with solid waste

Note: Improved sources include piped water, boreholes or tubewells, protected dug wells, protected springs, rainwater, and packaged or delivered water.

Note: Improved facilities include flush/pour flush toilets connected to piped sewer systems, septic tanks or pit latrines; pit latrines with slabs (including ventilated pit latrines); and composting toilets.

¹ WHO and UNICEF. (2021). Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs. WHO and UNICEF, Geneva.

² By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

³ By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Water for Women comprises civil society organisations (CSOs) and research organisations (referred to collectively as 'partners') working to deliver 33 projects covering a range of WASH topics in 15 countries in the Asia Pacific region. While the individual objectives of these projects are varied, at their base they support four core outcomes. Fund Outcome Two aims to achieve *'increased equitable, universal access to and use of sustainable WASH services, particularly for marginalised communities and community members'*.

Each Fund partner is considering the implications of the SDG targets in their context and how they can best contribute, including supporting governments to lead the transition in a way that does not entrench or exacerbate inequalities, particularly for the hardest-to-reach communities. Some Fund partners have monitored and reported on the baseline and progress against safely managed targets within their projects, while others have monitored individual aspects of safely managed services (e.g. water quality or emptying). All CSO partners, however, are required to measure and report against the number of beneficiaries who gain access to either basic or safely managed water and sanitation.

To support improved monitoring of safely managed water and sanitation within Water for Women and share methods and lessons, this learning initiative has compiled six case studies from Fund partners. These partners are monitoring a range of aspects of safely managed water and sanitation as part of their broader projects.

These case studies, and an accompanying synthesis report, provide examples of monitoring methods and considerations across country contexts. The target audience includes Fund partners, other WASH implementing organisations, local and national governments, and those involved in global monitoring initiatives related to WASH or SDG6.

The content and scope of the case studies were co-developed to present a range of contexts, approaches and experiences, as shown in Table 2. Each case study was drafted by the relevant implementing partner, and then peer reviewed by another partner, the University of Technology Sydney Institute for Sustainable Futures (UTS-ISF) and the Water for Women Fund Coordinator team. A synthesis of these case studies and wider Fund learning about monitoring safely managed services is provided in an accompanying report titled *'Monitoring Safely Managed Water and Sanitation Services: Synthesis of Case Studies from Water for Women'*.

The case studies presented in this report draw on a diverse range of countries and contexts, including both water and sanitation services in urban and rural areas. The case studies do not just present the methods but discuss the process of defining indicators and adoption of SDG targets by local and national governments. They also cover activities to support the implementation of monitoring and reflection on the considerations and challenges of monitoring safely managed services in these contexts. Most case studies cover a range of subjects, yet are ordered loosely around a focus on monitoring drinking water, sanitation and lastly the enabling environment for scaling up. The case study focus, core question addressed and key topic content are summarised in Table 2.



Table 2. Summary of case studies.

Partner	Focus, country	Title	Core question addressed	Key topic content
International WaterCentre, Griffith University	Water and sanitation, Solomon Islands	1. Monitoring Safely Managed WASH in Rural Melanesia	What value do the expanded SDG6 monitoring questions add to the project's understanding of water and sanitation service levels?	<ul style="list-style-type: none"> • Core vs expanded indicators • Water quality monitoring considering point of collection and point of use • Seasonal variations in water • Management of child faeces
University of Technology Sydney, Institute for Sustainable Futures	Urban water, Indonesia	2. Self-Supplied and Safely Managed: Urban Monitoring Challenges in Indonesia	What insights does monitoring water availability and quality in self-supply contexts in urban Indonesia offer global SDG monitoring approaches?	<ul style="list-style-type: none"> • Water quality monitoring • Water availability monitoring • Seasonal variations and multiple sources
SNV	Rural sanitation, Lao PDR, Bhutan, Nepal, global	3. Insights from Monitoring Safely Managed Rural Sanitation Services at Scale	How can expanded sanitation indicators be applied across contexts and at scale?	<ul style="list-style-type: none"> • Expanded rural indicators • Timely emptying • Use of monitoring data
iDE	Rural sanitation, Cambodia	4. Monitoring Safe Rural Faecal Sludge Management and Onsite Sanitation Systems	What data is strongly recommended to be collected to monitor safely managed sanitation in a rural sanitation market?	<ul style="list-style-type: none"> • Containment and emptying • Product sales and follow-up review • Measuring pit filling and household-driven monitoring
SNV	Rural sanitation, Bhutan	5. Embedding Safely Managed Sanitation Monitoring in Government Systems in Bhutan	How can existing data and knowledge be used to inform preliminary baseline estimates for safely managed rural sanitation?	<ul style="list-style-type: none"> • Combining program data, national data and expert knowledge • Rural shit flow diagrams • Challenges with integrating monitoring of safely managed sanitation into national systems
WaterAid	Water and sanitation, Papua New Guinea	6. Safely Managed Data for Government Monitoring and Decision-Making	How can project-based monitoring of safely managed WASH services be translated into government monitoring systems and use of monitoring data?	<ul style="list-style-type: none"> • Mobile data collection • Complexity of analysis of safely managed WASH services • Household water quality testing • Monitoring inequalities

1. Monitoring Safely Managed WASH in Rural Melanesia

Partner: International WaterCentre (IWC), Griffith University

Co-partner: Solomon Islands National University

Country: Solomon Islands

KEY MESSAGES

1. Given the reliance on household surveys for monitoring SDG 6.1 and 6.2, expanded questions may be necessary to accurately assess safely managed water and sanitation coverage.
2. Seasonal changes in water access, contamination of drinking water at point of use and the open defecation practices of infants and young children are issues from rural Solomon Islands that are not addressed by the Joint Monitoring Programme's core questions.
3. Resources and capacity constrain data collection, so justified and targeted data collection is required for accurate data.

Background

Organisation, partners and project

The International WaterCentre (IWC) of Griffith University and the Solomon Islands National University (SINU), supported by Water for Women, have been progressing two action research projects in Solomon Islands. The projects aim to increase the evidence base for informed water, sanitation and hygiene (WASH) interventions in a Melanesian context. Pacific Community Water Management Plus (PaCWaM+) [1], seeks to understand how civil society organisations and governments can better support rural community-based water management in the Pacific to improve Sustainable Development Goal (SDG) 6 outcomes. The Promoting Safe Child Faeces Management project (Safe CFM) is a behaviour change research project that explores the psycho-social, technological and epistemological determinants of CFM in rural contexts to support safe child sanitation and hygiene practices [2].

Case study context

In Melanesia, more than 80% of the population live in rural and remote areas, of which only 44% have access to basic water services. There is limited data on water quality for rural water systems and insufficient data at national or regional level to estimate coverage of safely managed services in almost all countries in the region [3]. Access to sanitation is lower still, with an estimated 20% of rural Melanesians accessing basic services.

IWC and SINU have monitored SDG6 service levels, using the Joint Monitoring Programme (JMP) service ladder standards, during the formative research phases in the projects to compare the WASH service levels experienced by village residents with national and global service levels, and to provide baselines for later phases of project implementation. For example, in PaCWaM+, one measure of how successfully a village managed its water system was the status of WASH services available to community members, including household water accessibility, availability, reliability and drinking water quality. IWC and SINU evaluated SDG6 service levels using data from household surveys and infrastructure spot checks, utilising both the core indicators and expanded questions provided by JMP [4]. PaCWaM+ comprised three rounds of data collection involving 314 households representing a population of 1,842 people in eight villages across Malaita, Isabel, Western, Central and Guadalcanal provinces in Solomon Islands. Safe CFM consisted of two rounds of data collection involving 53 households in five villages across Guadalcanal and Isabel provinces. Both research projects are now designing and testing interventions, and service levels will be measured again following interventions to evaluate outcomes.

Value of expanded SDG6 questions

The JMP is responsible for global monitoring and reporting of SDG6.1 (Safely Managed Drinking Water Services) and SDG6.2 (Safely Managed Sanitation Services). The JMP's massive exercise in global data synthesis, analysis and presentation is important for guiding investment in, advocating for, and assessing progress towards achieving universal and equitable access to safe WASH for all by 2030. According to United Nations Water (UN-Water), the focus between 2019 and 2022 is on building national ownership for SDG6 monitoring and data [6]. Notwithstanding, the challenges of monitoring safely managed services in developing country contexts like Solomon Islands are still emerging, leading to situations where the reported global and national service levels may be incomplete or inaccurate, particularly with respect to tracking inequalities and accounting for local realities [6,7].

The JMP recognises that for unregulated, mostly rural WASH service provision, household surveys (HHS) and national censuses following the JMP 'core' HHS questions remain the primary sources of data for global estimates, rather than the regulatory or administrative information expected from middle- and high-income countries [4]. In an effort to guide more context-specific and targeted data collection that can help track inequalities, the JMP also provides a set of 'expanded' HHS questions that, at present, are only integrated into national and global analyses and reports on an ad hoc basis (when national data allows).

In both projects, the HHS incorporated core and expanded questions to evaluate household and community service levels. The projects used this data to answer the question – *is there a need to include the expanded SDG6.1 and SDG6.2 questions in household surveys to more accurately describe water and sanitation service levels, instead of relying on the core questions alone?*

Monitoring SDG6 in the Solomon Islands context and benefits of expanded questions

Melanesia is a geographically and linguistically diverse region, and access around the region's many archipelagos can be extremely challenging. These challenges constrain not only the expansion of basic and safely managed WASH services but the ability of governments to monitor and evaluate service levels in rural Melanesia. Much of Solomon Islands' rural population inhabits high islands (rather than low coral islands), on which water tends to be reasonably abundant, at least in the wet season, and rainwater capture or spring-fed reservoirs are common sources of water. Sanitation access remains limited, with predominantly onsite pit-based or pour-flush latrines which are commonly shared between households.

The Pacific SDG Taskforce committed to reporting to three SDG6 indicators (6.1.1, 6.2.1, and 6.3.1) under the Pacific Roadmap for Sustainable Development was established in 2015, and currently reports against the first two [8, 9]. In Solomon Islands, collecting data against these indicators is the responsibility of the National Statistics Office, supported by regional bodies such as the Pacific Community's Statistics for Development Division. Population, housing, and health censuses have been conducted sporadically in Solomon Islands, with the last complete and publicly available census taken in 2009. Existing JMP estimates for Solomons Islands are derived from these mixed sources. A more recent (2015) baseline WASH household survey was conducted by the United Nations Children's Fund (UNICEF) and the Solomon Islands Ministry of Health and Medical Services [8]. A census was conducted in 2019 and is likely to be released in late 2021.

For the global SDG6 indicators to meaningfully represent real WASH situations, they require local application that takes local risks into account. The expanded indicators can allow such place-based monitoring and analysis to occur, as illustrated by the examples in this case study, where the expanded indicators were used to screen water and sanitation risks present in rural communities in Solomon Islands. For these examples, and likely many other monitored rural water and sanitation services around the world, reliance on the core indicators alone could result in overreporting or underreporting WASH service levels, with the likely outcome that the picture of safe and equitable access is inaccurate.

What are the challenges in using expanded questions?

Practitioners, governments and academics have debated the veracity and practicality of the definitions and monitoring methods for SDG6 indicators. Particular challenges have been raised. Data collected at a national level can differ substantially from the realities of WASH service delivery at local levels [7], and the governance of monitoring processes can be fragmented, with unclear responsibilities allocated between government ministries and related non-government entities [10]. In many low-resource monitoring environments, such as in Pacific islands, investment in routine national monitoring of water and WASH indicators has thus far been insufficient [11]. This challenge increased with the inclusion of indicators such as water quality that require additional training, materials, and effort to obtain data.

Thus, in proposing the use of the expanded indicators or other complementary, nationally defined indicators, as some suggest (e.g. [12]), IWC acknowledge the reality that this will require even more resources, funding, capacity and training. Regarding household surveys and indicators involving water quality monitoring, it should be noted that statistically representative methods that require surveying only a cross-section of households across the nation, rather than every household, are available to manage this burden, as followed in the UNICEF-supported baseline WASH household survey. Further, some of the expanded questions require only limited additional resourcing, such as expanded questions on the management of children's sanitation discussed below.

A secondary challenge is that, for those responsible for monitoring programs, knowing the appropriate application of the core and the expanded indicators can be difficult. At present, there appears to exist some uncertainty about when, where and how the expanded questions could, or should, be used. This includes within the JMP itself, for example with respect to pit latrines or septic tanks, where 'good' containment is considered to mean 'safely treated and disposed of in-situ'. The most recent SDG6 JMP Progress Report (2021) presents some of the widely varying measures of containment across national surveys and censuses [13]. However, containment and discharge are only addressed in expanded questions (XS9 and XS10), leaving the core questions to focus on emptying and disposal.

Expanded question on seasonal monitoring and service level snapshots

In the PaCWaM+ project, in recognition of widespread multiple water source use in Melanesia (e.g. rainwater (Figure1), groundwater, springs and small dams), IWC and SINU sought to identify variations in wet and dry season water service levels available to residents in rural villages (JMP Expanded Question XW11). In some villages, like Dadala in Solomon Islands, differences were substantial. In the dry season in Dadala, household access to safely managed water services fell to 7% of houses in the community, and unimproved service access jumped to 25%.



Figure 1. Inspecting a water storage tank in Huvalu, Solomon Islands.

The JMP core questions for main and secondary water sources in households do not differentiate between wet season and dry season water access, and this is reflected in both the national survey data used by the JMP to estimate service levels in Solomon Islands, and UNICEF's more recent 2015 baseline WASH survey, the latter of which recognises the limitations of a cross-sectional survey design in capturing temporal differences [7]. In the PaCWaM+ research project, some survey questions were intentionally focused on household's wet season source, and the same set of questions was asked for the household's dry season source (if different). From these data, the project determined the household water service level based on JMP service ladder definitions. Figure 2 compares the wet season, dry season, and national rural service levels for the village of Dadala; the shift for households from the upper end of the ladder to the lower end between wet and dry seasons can be observed. These changes were due to general declines in water quality or availability during the dry season.

The seasonal basis on which national (or global) estimates are provided is normally unclear, making the comparison of local to national service levels a challenge. Without the use of the expanded question in this scenario, service level snapshots could provide only a partial picture of household experiences throughout the year. In a highly seasonal location like Dadala, the benefit of asking the expanded question is a more comprehensive assessment of year-round service levels for households.

Such differences in wet and dry season water services become increasingly important in the context of a changing climate and predicted increases in climate extremes (more protracted periods of drought coupled with shorter, more intense periods of rainfall and associated changes to water quality). In this context, resilience and ongoing access to water is the priority (for example, see Elliott et al. [14] or Kostyla et al. [15]). Furthermore, Solomon Islands, along with 43% of the world's population, is in the tropics, a region projected to experience large climate change impacts over the next century [16].

Comparison of SDG6.1 water service levels using expanded indicator JMP XW11. Dry and Wet Season Sources Population from all Dadala households (n = 84)

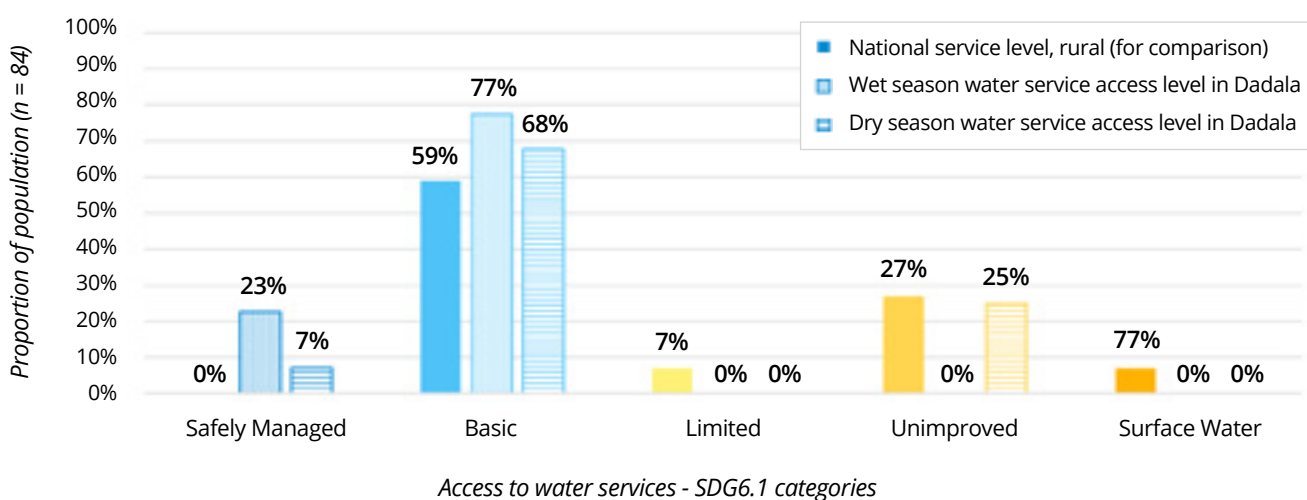


Figure 2. Comparison of SDG6.1 access to water services in wet and dry season situations.

Can we really understand if a service is 'safely managed' without monitoring water quality at point of use?

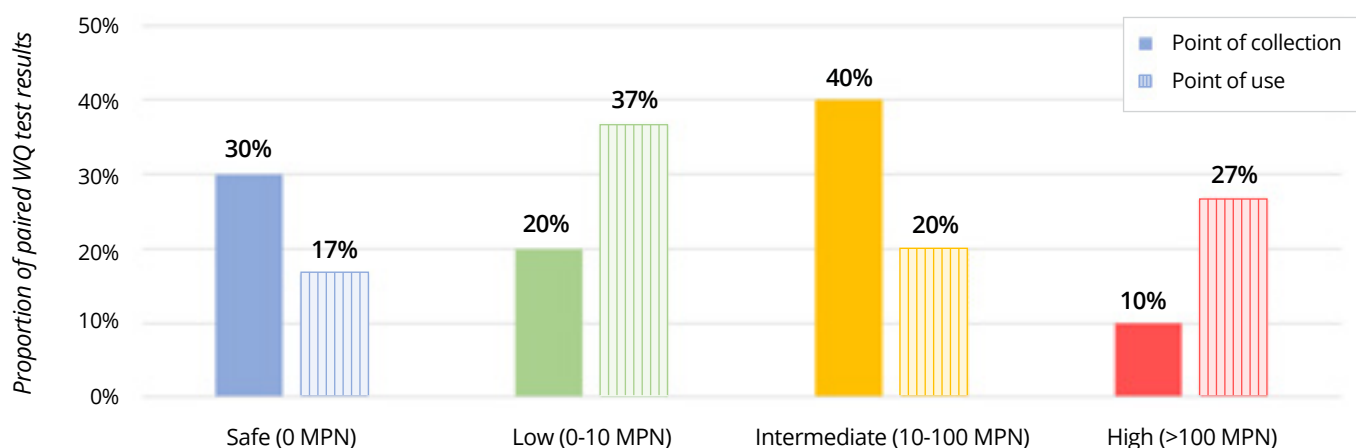
The JMP core questions for safely managed water service levels require water quality testing only at the point of collection (PoC) for water, for example, the tap or tank from which water is delivered (so-called 'water source'). The JMP acknowledges the limitations of this, but points to a scarcity of data to expand global estimates to reflect household-level (point of use) water quality assessments [17]. It is well established that microbial water quality often deteriorates through water distribution networks, householders' collection, conveyance and storage actions, particularly when sanitation and hygiene service levels are also low [18,19]. This is relevant to Solomon Islands, where shared and decentralised water access from a piped distribution system is common, and many households use containers for water collection and storage.

Drawing on data from 14 villages contributing to the PaCWaM+ project, IWC and SINU analysed 30 matched PoC and point of use (PoU) water quality microbial data (*Escherichia Coli* [*E. coli*]) from samples taken during field work (Figure 3 and Figure 5) (JMP expanded question XW12). That is, *E. coli* levels at the tap, tank, handpump or spring were measured, and then tested in a household container from that same source. Sixty per cent of container samples had higher contamination levels than the source, 20% lower, and 20% showed no change.

Most worrying, amongst the matched pairs, there was a 17% greater prevalence of high-risk concentrations of *E. coli* in PoU samples than PoC samples (refer Figure 3). Other studies in this area have shown that PoU quality can change regularly and rapidly: Price et al. [20] demonstrated how *E. coli* levels in household drinking water samples in an informal settlement changed seasonally and in some cases daily, confounding efforts to evaluate and report a consistent water service level. In many settings, households are not drinking water directly from the tap but rather from containers within their households, and thus potentially being exposed to pathogens even though the PoC sample may indicate water free of contamination. Evidently, the benefit of testing water at PoU, where possible, allows for a better understanding of where additional interventions to disrupt contamination pathways, like household water treatment, might be required.

The Solomon Islands Government's guidelines for monitoring access to WASH specify water quality testing of water supplies in communities, schools and health centres. In assessing household access to WASH, the guidelines recommended water quality testing at the PoC. A national survey has not been conducted since the introduction of these updated guidelines, but provincial 'snapshots' have, and at least one province has included water testing in its monitoring. This indicates an intention to more widely adopt water testing in routine WASH monitoring, though currently with a focus on PoC assessment rather than PoU.

Comparison of Water Quality test results at Point of Collection and Point of Use with WHO risk guidelines (based on E-Coli results, n=30)



Risk-based categories using Most Probable Number (MPN) of E-Coli bacteria colonies in a given sample. Categories are adopted from WHO guidelines.

Figure 3. Comparison of point of collection and point of use samples with WHO water quality risk-based guidelines.

Expanded question on management of child stools: If not 'for all', is the service level accurate?

Access to sanitation services under SDG6.2 is estimated globally based on household access, which tends to overlook infant and young children's practices and sanitation requirements within households [21]. The core indicators from the JMP do not differentiate between household members, although such questions are available through the expanded indicators.

The Safe CFM project monitored sanitation service levels in 53 households across five villages using the core indicator questions as a project baseline. IWC and SINU concurrently asked households about their management of child stools (JMP expanded question XS5). The findings concurred with other research on the topic – that even in households with access to at least basic sanitation, the faeces of infants and

young children may still be thrown in the bush or a river or the sea, resulting effectively in open defecation [22].

Figure 4 presents the household survey and spot check observational data, harmonised with reported child stool disposal data, to evaluate a sanitation service level across the 53 households. When not including child faeces disposal it was found that 25% of households practised open defecation, but this increased to 40% when the additional question was included. This data provides another example of how, without the inclusion of specific expanded questions, the evaluated JMP service level may provide only a partial view of household behaviours and underreport population-wide open defecation behaviours. The targeted inclusion of CFM questions can have contextual benefits for governments and practitioners, in that they can identify locations in which improved CFM practices would reduce pathogen loads in the environment.

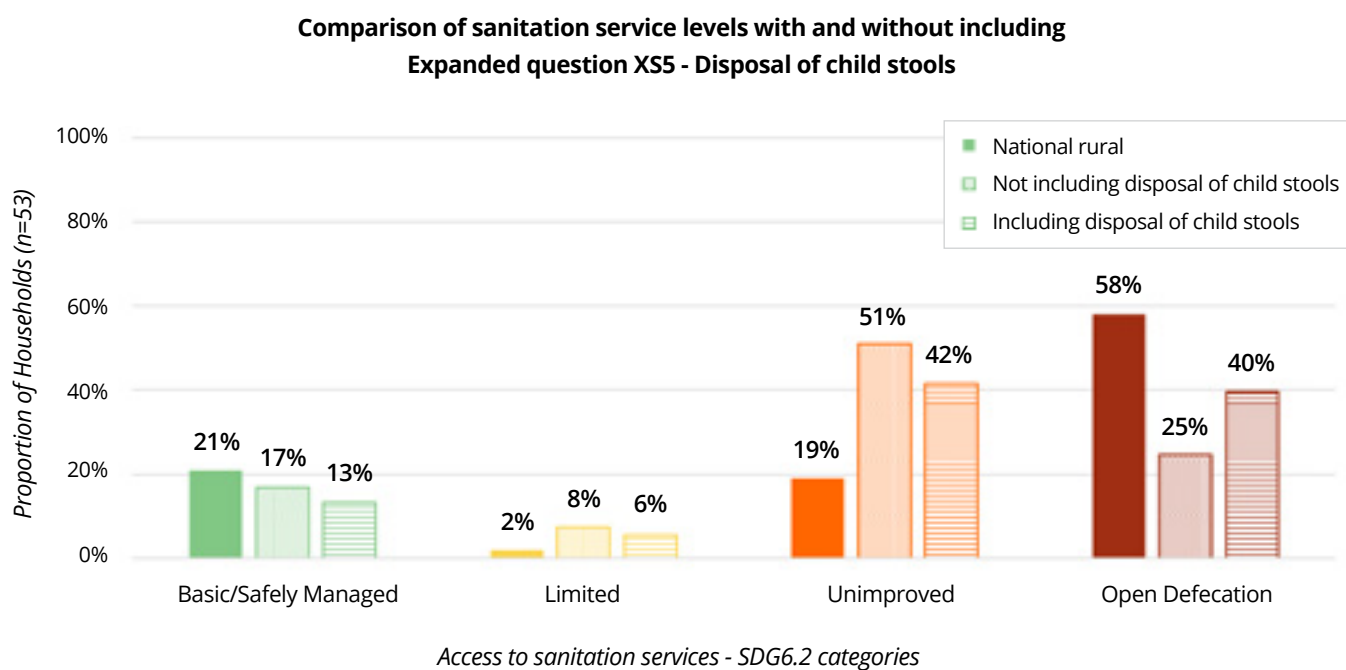


Figure 4. Comparison of SDG6.2 access to sanitation.

Recommendations

At least some of the expanded indicator questions can provide vital risk-based screening, and indeed act as modifiers to assess water and sanitation service levels.

In the context of Pacific rural communities, the assessment of water service levels should, where possible given time and resource constraints, use targeted expanded questions relating to testing PoU water quality, and accessibility at different times of the year to evaluate SDG6 service levels more accurately. The addition of the expanded questions relating to child faeces management, for example, would only require a few additional questions asked only of households with children under five years of age.

For governments and other agencies monitoring WASH service levels, these reflections indicate the importance of considering local application of the JMP WASH service level definitions and the best way of evaluating them.

Collecting and using data in an informed and meaningful manner might require drawing on both core and expanded questions. In the case of Solomon Islands' rural villages, this should include expanded indicators that recognise seasonality, inclusivity and household behaviours.

Evidently, inclusion of expanded indicators into monitoring processes requires judicious analysis of contextual relevance by governments and agencies to make best use of limited resources. The global monitoring program should be empowering nations to make those decisions by strengthening capacity and better communicating the purpose of the expanded indicators.

Furthermore, this case study highlights the importance of specifying the exact SDG6 indicators used to prepare WASH assessments, so that assessments from different points in time, or between different locations, are compared appropriately. This includes data reporting on global and national platforms, which are often used for intercountry and longitudinal comparisons.



Diana Gonzalez, International WaterCentre

Figure 5. Water quality testing in Maravovo, Solomon Islands.

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2. Self-supplied and Safely Managed: Urban Monitoring Challenges in Indonesia

Partner: University of Technology Sydney, Institute for Sustainable Futures (UTS-ISF)

Co-partners: Universitas Indonesia, United Nations Children's Fund (UNICEF) Indonesia

Country: Indonesia

KEY MESSAGES

1. In Asia and the Pacific, almost one third of households use self-supply as their main source of drinking water, creating a critical imperative to monitor the extent to which this provides safely managed services.
2. Evidence from Bekasi city suggests conventional Joint Monitoring Programme questions and methods for assessing safely managed services in non-piped systems may not be suited to the water supply realities of self-supply.
3. Widespread compliance with boiling practices in Kota Bekasi means monitoring water quality at point of use rather than source would better reflect actual safety of self-supply.
4. Since self-supply is susceptible to seasonal changes, point-in-time monitoring may misrepresent availability. More accurately understanding availability may be important to ensure sufficient water for non-domestic uses, not just for drinking water.
5. Monitoring of self-supply in urban Indonesia and other countries with high prevalence of self-supply as a service delivery model should consider quality at point of use and assess availability in relation to non-drinking sources, particularly in drier months.

Background

Organisation, partners and project

Transitioning to Safely Managed Water Services is a research project in Indonesia and Vanuatu led by UTS-ISF in partnership with the Universitas Indonesia, the University of the South Pacific and UNICEF. The project evaluates the risks and opportunities associated with on-premises, self-supply water sources, and aims to support policymakers and practitioners across Asia and the Pacific to engage with self-supply as they transition towards safely managed services for all. More than 800 million people in the Asia Pacific region depend on self-supply sources that are owned, managed and invested in by individual households (Figure 6).

Case study context

This case study focuses on Kota Bekasi in Indonesia. Kota Bekasi is a densely populated city located in West Java province, with a population of 2.5 million [2]. Households in Kota Bekasi are heavily reliant on groundwater self-supply (i.e. private boreholes and dug wells). Results from the 2010 census showed 39% of the population in Kota Bekasi used groundwater as a drinking water source, with district-level dependence as high as 71% [3]. In contrast, just 9% of the population had access to piped water. Packaged water (bottled and refill – Figure 7) bridged the gap between self-supply and piped services, and was used by around half of the Bekasi population.

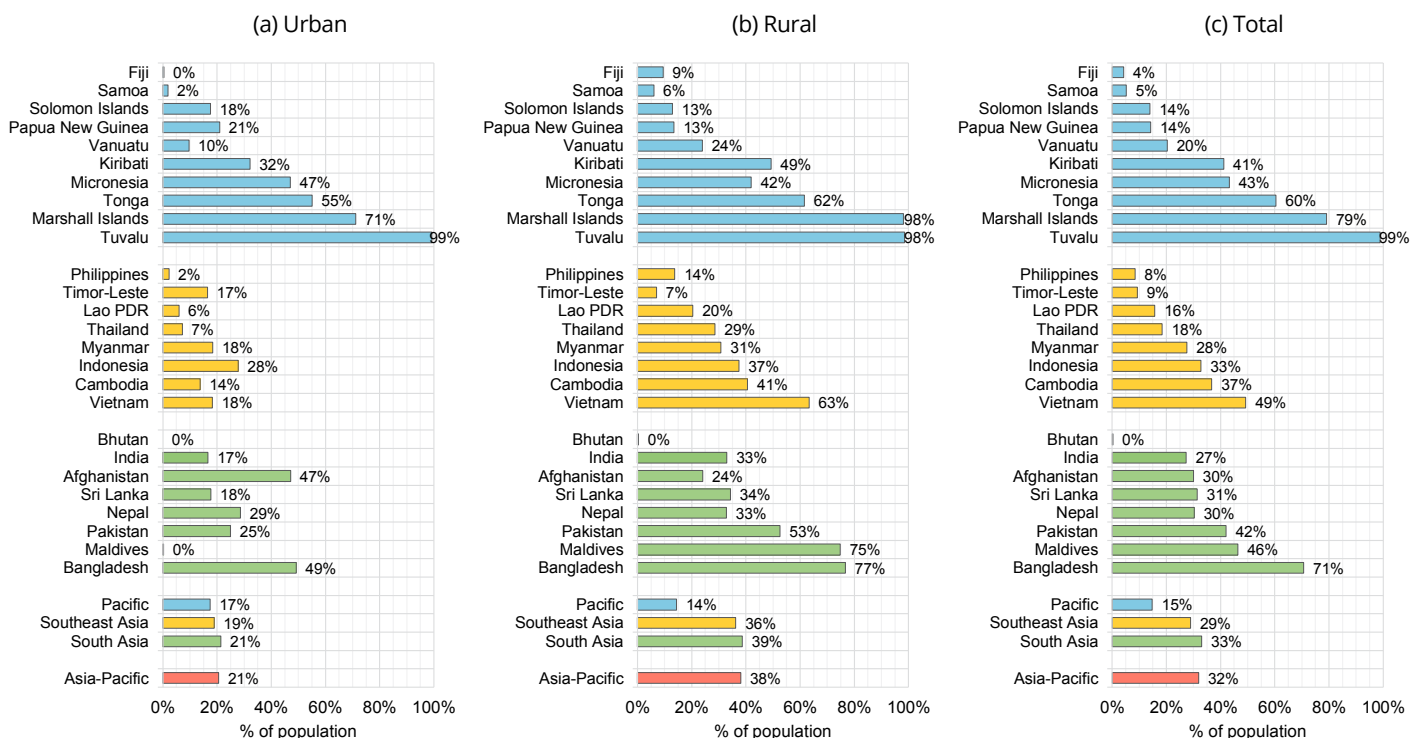


Figure 6. Proportion of population using self-supply in the Asia-Pacific [1].

The situation in Kota Bekasi is replicated across many Indonesian cities. In total, around 42 million urban Indonesians – 27% of the urban population – use groundwater self-supply as their main source of drinking water, and a further 44 million use groundwater self-supply for other non-drinking domestic purposes [4]. Despite ranking 107 out of 189 countries on the Human Development Index, Indonesia is ranked in the bottom 10 countries in the world in terms of use of piped water for drinking in urban areas. A key driver of this situation is the widespread preference for bottled and refill water, with around half of the urban population reporting these as their main source of drinking water [4]. While increasing use of bottled and refill water is reducing dependence on groundwater self-supply as a drinking water source, it remains a source of non-drinking water for more than half the population (Figure 8).



Figure 7. Refill water gallons for sale.

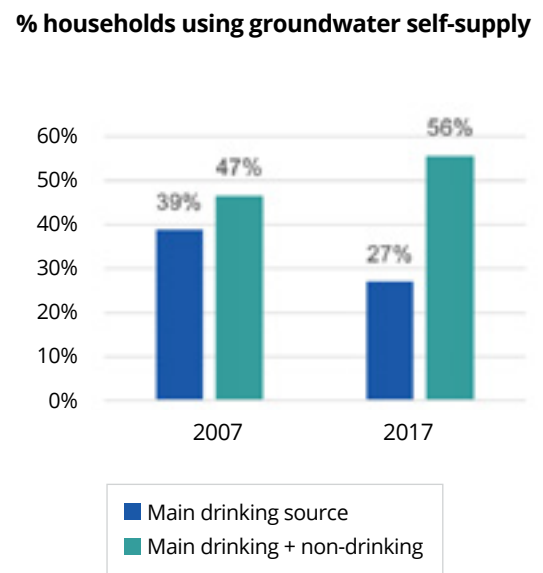
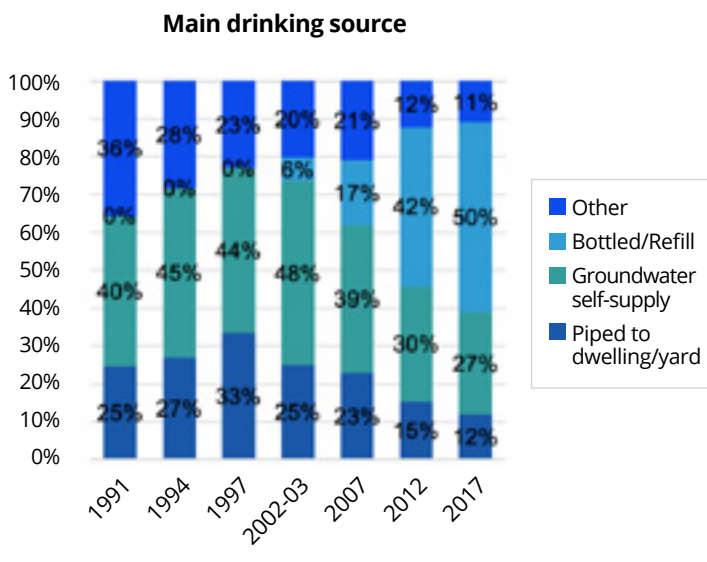


Figure 8. Proportion of population using groundwater self-supply in urban Indonesia **Source:** Authors' analysis of [4]-[10].

The *Transitioning to Safely Managed Water Services* project has focused on three districts within Kota Bekasi where self-supply is common: Bantar Gebang, Jatiasih and Jatisampurna. Across 300 randomly selected households, more than half (54%) self-supply their drinking water from private dug wells or boreholes, while a third (34%) depend on refill or bottled water (Table 3).

This case study draws on data from this study site to highlight some of the limitations of current Sustainable Development Goal (SDG) monitoring approaches in self-supply contexts and provide suggestions for ways forward.

Table 3. Water sources used in study sites in Kota Bekasi for drinking and other domestic purposes.

Source type	Main drinking source	Main source for other domestic purposes
Groundwater self-supply	54%	78%
Public groundwater source	12%	20%
Refill water (Large gallons refilled at depot with locally treated water)	21%	1%
Bottled water (Single-use commercial bottles)	13%	0%

Note: JMP classifies refill water and bottled water together as packaged water, and they are considered 'improved'.



Insights from monitoring water availability and quality

To be considered safely managed according to the Joint Monitoring Programme (JMP) monitoring definition, a water service must be:

- accessible on the premises
- available in sufficient quantities when needed
- free from contamination.

Almost by definition, self-supply means water is accessible on the premises. Performance of self-supply in relation to availability and water quality, however, requires scrutiny like any other water service.

In order to monitor water quality and availability of drinking water in urban areas, the JMP often relies on data from utilities [11]. This data is routinely collected and reported on by utilities and regulators, so it is a low-cost way of tracking the performance of water services used by a large number of people. However, in urban settings where self-supply is common – such as Kota Bekasi and many other Indonesian cities – this approach will result in misleading statistics at both national and sub-national levels.

In settings where piped water coverage is below 80%, the JMP instead looks to nationally representative survey data to measure water quality and availability. Presence/absence of *Escherichia coli* (*E. coli*) at the source is the accepted indicator of water quality, while availability is often measured by the key question: *“In the last month, has there been any time when your household did not have sufficient quantities of drinking water when needed?”*

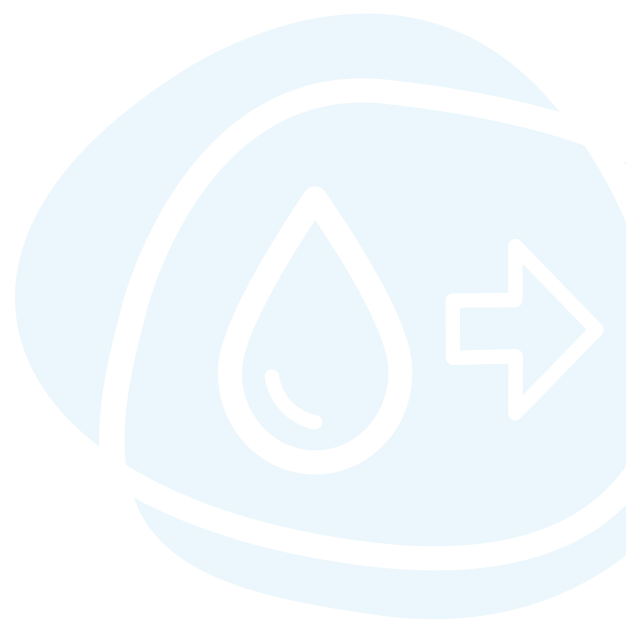
This case study critically examines the suitability of these approaches in the context of Kota Bekasi, through analysis of data from a survey of 300 households, testing of water quality at source and point of use (PoU), and a monthly mini-survey of 60 households.

Measuring water quality at point of use is important

The standard approach for measuring water quality for SDG purposes is to assess presence/absence of *E. coli* at the source. When applied to households in Bekasi, 41% of households have water that is free from contamination, with higher proportions of households with contaminated self-supplied groundwater sources (59% contaminated) than packaged water (22% containment, including both bottle and refill). However, this monitoring approach provides a limited understanding of microbial water quality.

First, households in Kota Bekasi (and elsewhere in urban Indonesia) commonly boil their self-supplied ground water prior to drinking. Hence the quality of water from wells or boreholes improves substantially by the time it is at PoU (Figure 9). This is important because when measured at the source, groundwater is clearly more contaminated than packaged water; but when measured at POU, this disparity is much reduced. Therefore, striving for safely managed water services based on conventional JMP approaches could result in a strategy that is substantially different (and potentially misguided) from one that considers water quality at PoU.

A further limitation of water quality ‘snapshots’ based on survey data is the influence of seasonality. Water quality typically deteriorates in the rainy season, when runoff, flooding and elevated water tables can cause contamination. The degree to which seasonality affects water quality in Bekasi will soon be known, with another round of water quality testing planned in the coming months.



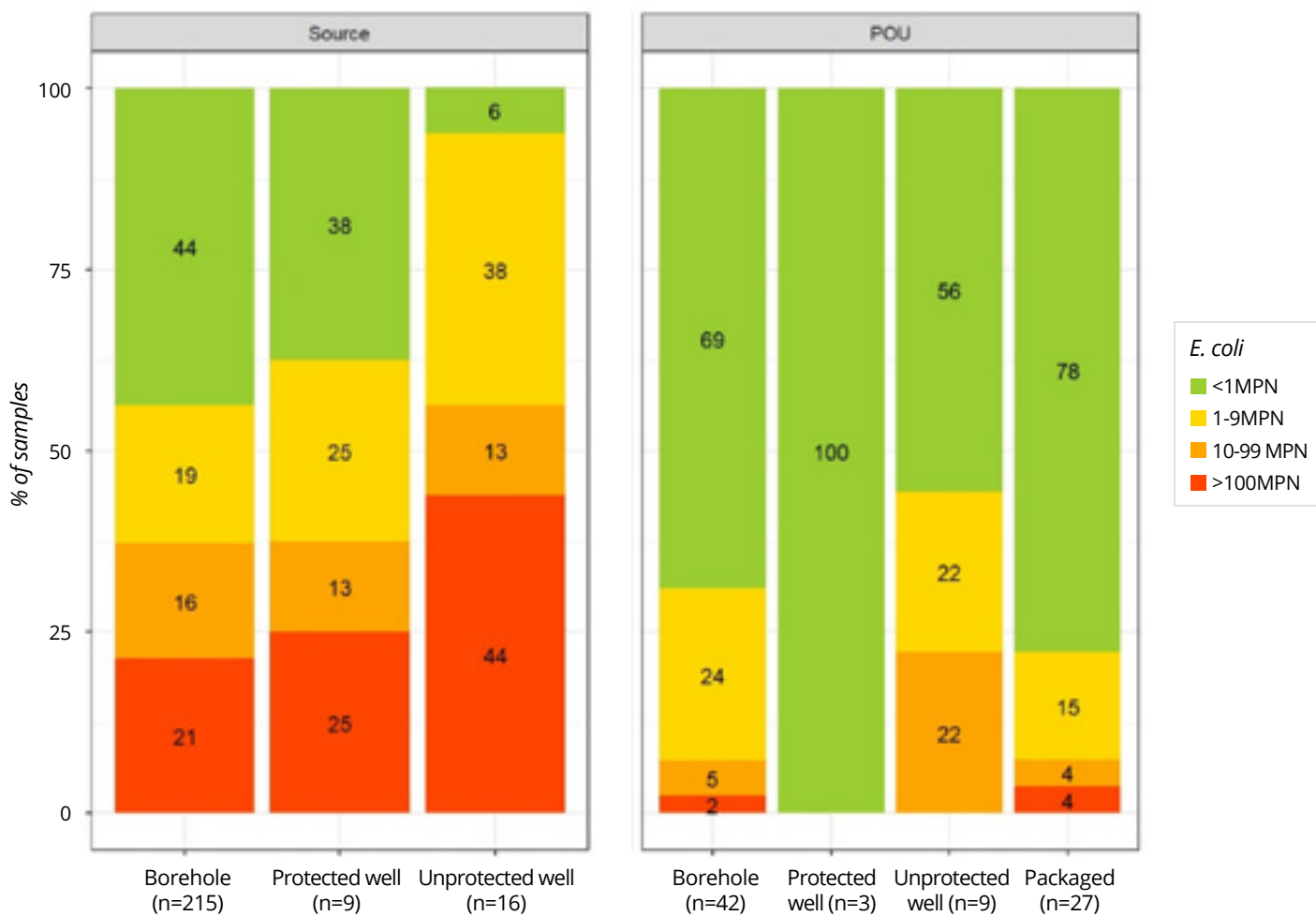


Figure 9. *E. coli* concentration in water at the source and point of use in Kota Bekasi [12].

Availability of sufficient quantities of water when needed varies by purpose and season

For non-piped water systems, the standard approach for measuring water quality for SDG purposes is to ask households if there has been any time in the last month when they did not have sufficient quantities of drinking water when needed. This question applies the concepts of availability and quantity to the drinking water source. This is sound in contexts where a single water source is used for all of a household's needs. However, if a household uses multiple water sources, the framing of this question becomes problematic. A further limitation is that water availability may vary by season, meaning this indicator may be influenced by the time of year a survey is conducted.

In Kota Bekasi, around a third of the population drink bottled or refill water whilst relying on groundwater self-supply for other domestic needs. Taste, safety and appearance are paramount criteria for choosing a drinking water source, while availability in sufficient quantities takes primacy for non-drinking sources (Figure 10). This reflects the reality that the quantity required for drinking is typically a small fraction of a household's overall water use. Therefore, only monitoring the sufficiency of water for drinking may mask water quantity constraints that affect other domestic water needs. In settings where multiple water sources are used, avoiding specification of a drinking water source when asking about availability and sufficiency would be a more appropriate approach.

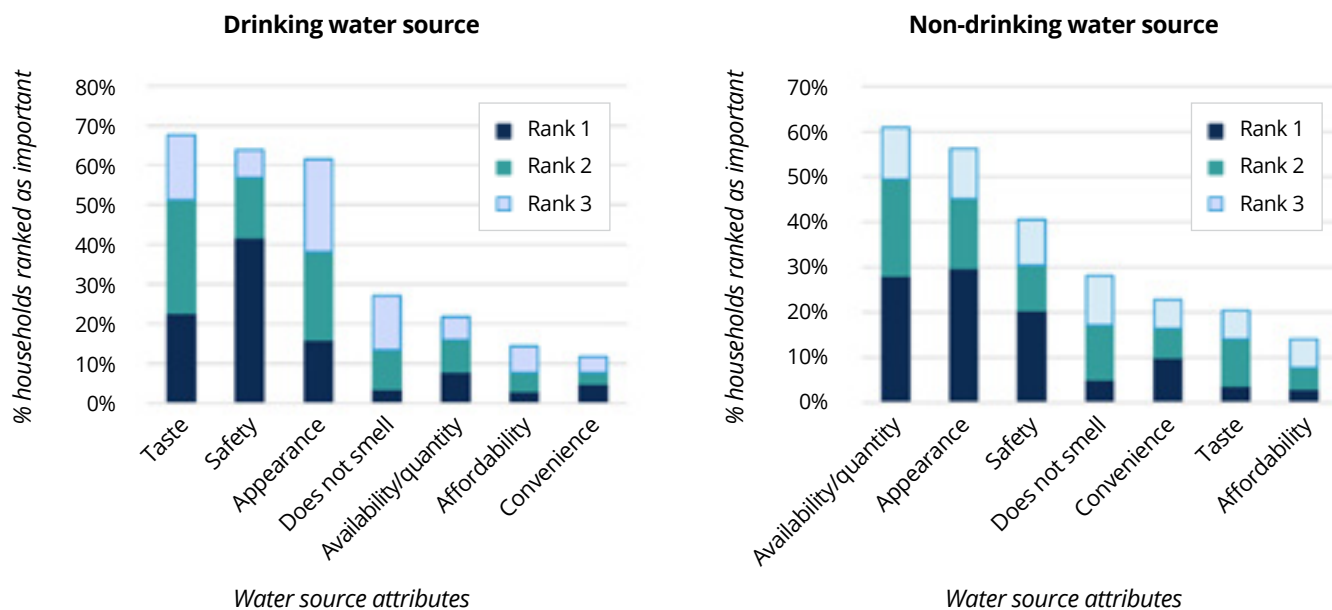


Figure 10. Most important water source attributes as ranked by households in Kota Bekasi, Indonesia **Source:** UTS-ISF

To explore implications of seasonality and use of multiple water sources on household perceptions of availability, the standard SDG question wording was included in a monthly survey of 60 households. If households reported using a non-drinking water source that differed from the drinking water source, a follow-up question was included to ascertain whether that non-drinking source also provided sufficient quantities when needed.

Household responses revealed two things (Figure 11). First, households might report having sufficient quantities of drinking water, but at the same time have insufficient quantities of water for other domestic needs. Second, sufficiency of water varies from month to month. Responses from Kota Bekasi show that fewer households report having a sufficient quantity of water in the drier months.

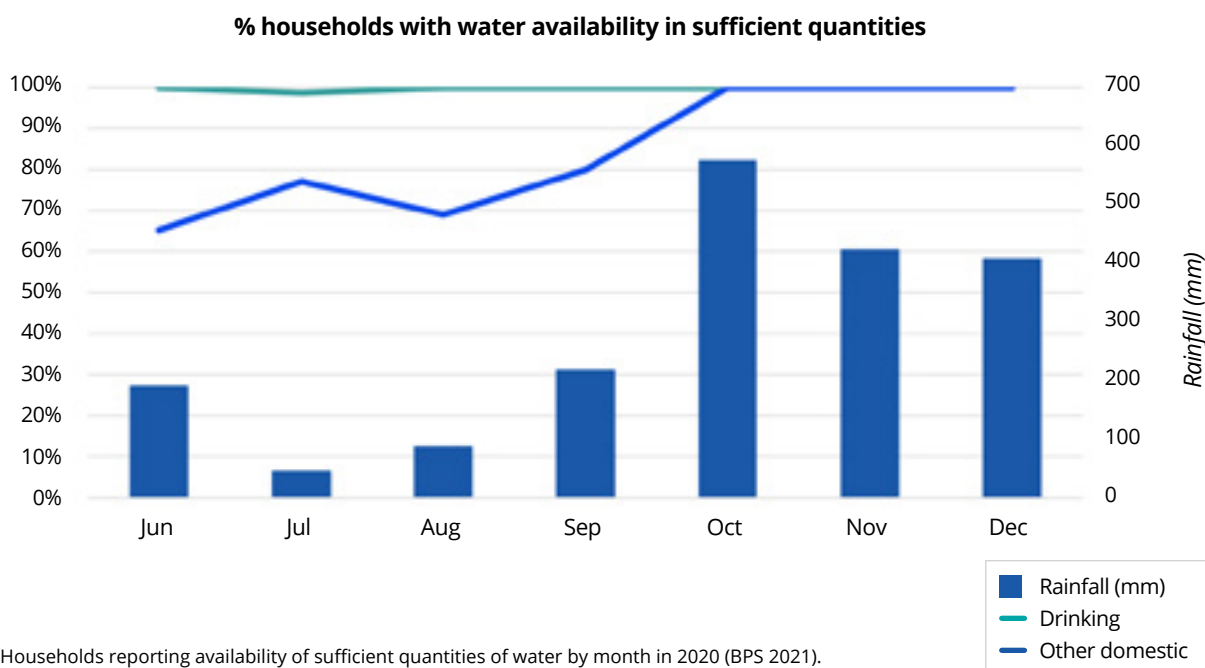


Figure 11. Households reporting availability of sufficient quantities of water by month in 2020 (BPS 2021).

Conclusion

Monitoring water quality and applying availability criteria are pragmatic responses to complex water use behaviours, but they have limitations, particularly in settings where self-supply is common. Utility data does not necessarily reflect the services levels experienced by self-supplying households, and household surveys may have a seasonal bias. Moreover, the SDG's focus on a single drinking water source overlooks non-drinking uses for which availability of sufficient quantities might be most critical, and it fails

to consider changes in water quality between the source and point of consumption. Simplicity and harmonisation are important aims that necessitate a one-size-fits-all approach to monitoring safely managed water at a global level. However, in order to support local, fit-for-purpose strategies and policies – particularly in urban areas with widespread self-supply – more nuanced indicators and assessments areas are essential.

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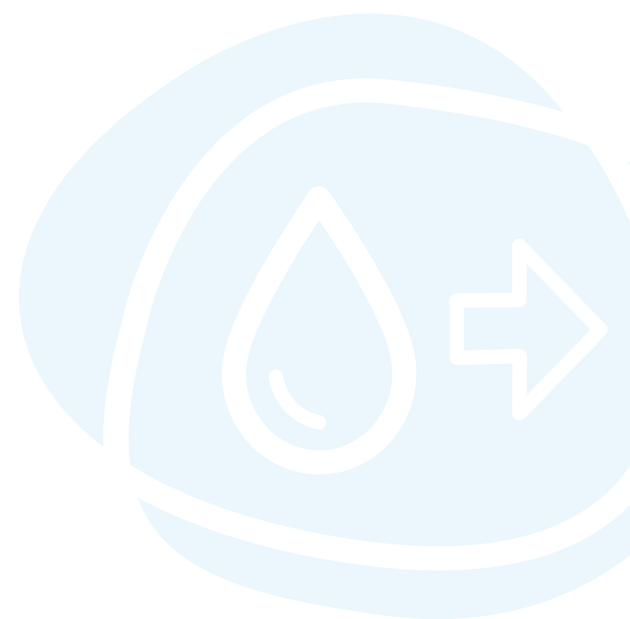
The UTS-ISF and Universitas Indonesia team would like to acknowledge the households that participated in large-scale surveys in Kota Bekasi that contributed to the evidence base for this case study.

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3. Insights from Monitoring Safely Managed Rural Sanitation Services at Scale

Partner: SNV Netherlands Development Organisation

Co-partner: University of Technology Sydney, Institute for Sustainable Futures (UTS-ISF)

Country: Lao People's Democratic Republic (PDR), Bhutan, Nepal, Global

KEY MESSAGES

1. Timely safe emptying of pits considering age, sludge volume, sanitation technology types, and the health and safety practices of service providers are aspects of quality that should be considered when monitoring safely managed sanitation services.
2. Alignment of national monitoring systems with Joint Monitoring Programme data is valuable, and strengthened by additional monitoring on certain dimensions (e.g. environmental safety, functionality). These data can be used in multi-stakeholder processes to inform and adjust approaches and services.
3. Standardising tools, whilst also ensuring any necessary adjustments for contexts, allows for comparison and learning across countries, improves quality and supports longitudinal monitoring.

As an integrated approach to sanitation, SSH4A has been highly successful [1]; it has been implemented in more than 160 districts and has contributed to over five million people gaining access to and using improved sanitation over the past five years alone. As part of Water for Women, this includes SNV's Beyond the Finish Line project in Lao PDR, which aims to improve sanitation and hygiene access for 200,000 rural people across three districts in Savannakhet Province, and in Bhutan for 275,000 people across eight districts, both in partnership with UTS-ISF.

Case study context

National monitoring systems in these countries have made varied progress in aligning with Sustainable Development Agenda ambitions and to track the Sustainable Development Goal (SDG) 6 WASH-related 2030 targets, each from varied starting points but commonly focused on open defecation free (ODF) related measurements. SNV has been monitoring safely managed sanitation services across 18 countries as part of its rural (and urban) sanitation and hygiene programs using standardised survey tools, mobile phone-based technology (AKVO Flow), and disaggregated analysis since 2014. As guided by SNV's SSH4A Performance Monitoring Guidelines [2], the objective of this is to support stakeholder learning and reflection and their progress towards sustainable services for all. Monitoring at regular intervals helps to improve programs and engages teams to move in the right direction.

The current monitoring approach in rural settings takes into account the higher service levels and ambitions of the SDGs, as well as learning from SNV's urban sanitation programming, including monitoring in schools and health care facilities since 2017. Common indicators and definitions have been harmonised and applied by each SSH4A project across the countries to ensure standardisation and enable cross-country comparisons, whilst still enabling adaptations to country contexts. This case study shares insights from multi-country, longitudinal monitoring for safely managed services at scale.

Background

Organisation, partners and project

SNV Netherlands Development Organisation (SNV) is a not-for-profit international development organisation that makes a lasting difference in the lives of people living in poverty by helping them raise their incomes and access basic services. SNV has a long-term, local presence in 24 countries in Asia, Africa and Latin America. Sustainable Sanitation and Hygiene for All (SSH4A) is SNV's integrated rural sanitation approach to strengthen the capacity of local authorities in developing and enforcing area-wide sanitation service delivery. The approach creates demand for sanitation services, develops sanitation supply chains in rural areas, builds capacity for hygiene behaviour change, and supports knowledge and learning to strengthen inclusive water, sanitation and hygiene (WASH) governance systems.

Approach to measuring rural safely managed sanitation services

The SSH4A indicators for sanitation align with the Joint Monitoring Programme (JMP) ladder (Figure 12, left) but with more detailed information on certain dimensions that are used to inform program interventions, including:

- Functionality of the toilet (in separating human faeces from human contact)
- Environmental safety of the toilet (not contaminating ground water and living environment)
- Use and cleanliness of the facility
- Accessibility for all
- Facilities for safe menstrual hygiene management
- Safely managed sanitation (replacement, emptying, transport, treatment, disposal and/ or reuse)

Within SNV's monitoring system, these dimensions are analysed separately because they require different measures of improvement. For example, the toilet functionality indicator is separate from the toilet use and cleanliness indicator, unlike in the JMP ladder. This allows teams to design targeted interventions based on the data to (for example) adjust supply chains or tailor behaviour change communications.

The SNV dimensions can be collapsed back into a JMP safely managed sanitation ladder to facilitate comparison with national data as needed. For example, Figure 12 compares safely managed services for Nepal in specific project districts and regions against national JMP data (rural). This was used during a meeting with national stakeholders and teams, in which survey data was combined with field experience to identify major risk areas and tailor interventions for the hills, mountain and terai regions.

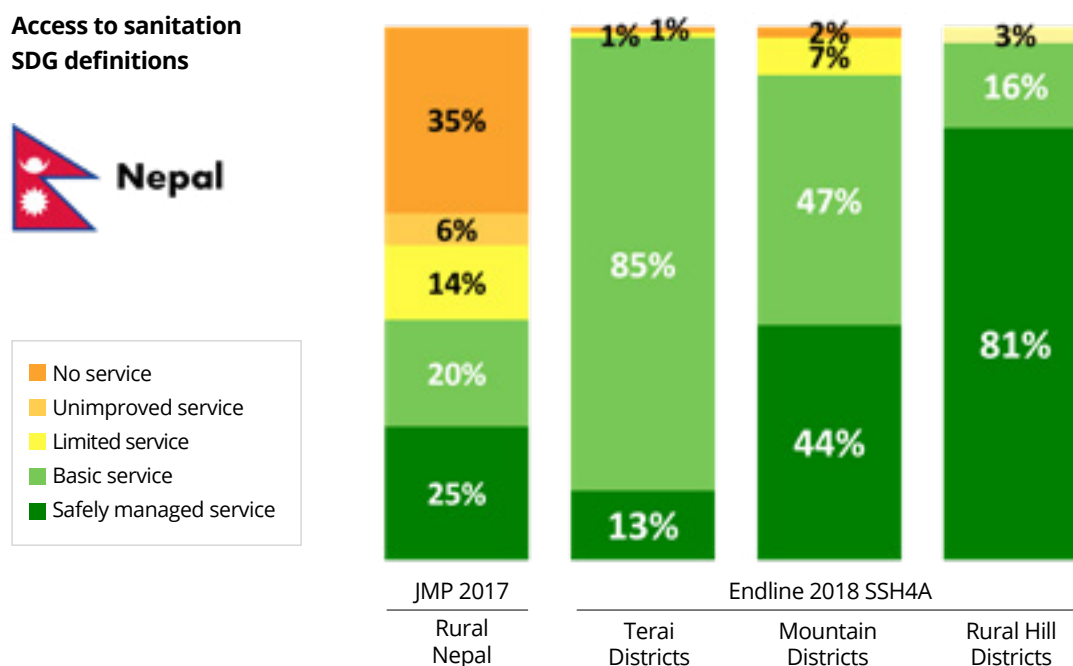


Figure 12. Access to sanitation comparison between JMP and SNV estimates in rural Nepal **Source:** SNV SSH4A Progress Brief, 2018 [3].

A key impact indicator in the rural performance monitoring guidance is 'safe management of toilet contents', which is measured using a qualitative information scale, as shown in Table 4 below. It is a composite indicator, informed by the aggregation of data from a number of survey questions about what happens to the pit contents, risks of polluting the surrounding environment and the extent this could lead to contamination. It is assumed that in rural areas, all sanitation facilities are onsite and if pits or tanks fill, they will need to be emptied or replaced. In contrast to the JMP indicator, this indicator addresses the timeliness of emptying, as well as the environmental and personal safety of the provider (e.g. wearing personal protective equipment (PPE), not entering the pit). The indicator is the same for households, schools and health facilities, but they differ in the calculation of timely emptying thresholds (see below). Within the JMP guidelines for the SDGs, advanced sanitation service levels for institutional settings (school and health care facilities) are not defined but should be set according to local context.

Importance of timely emptying

There is huge variation in the frequency of emptying rural pits and tanks. Some of these have not yet filled, but others are unlikely to fill up because they are leaking to the environment or otherwise discharging. Many households report that their pit has never filled. In order to define an objective threshold, SNV introduced the concept of timely emptying in their monitoring approach in 2014. At first this included a flat threshold of 3–5 years, similar to what is used in scheduled desludging. This approach also considered that with emptying frequencies of more than five years, sludge would solidify, which would motivate people to enter the pit to empty it.

The practice of pit entering was considered essential to avoid, even when pit contents are dry. In addition to the risk of contamination and poisoning, there have been stories of pits collapsing with people in them. More recently, SNV introduced country-specific and technology-specific timely emptying thresholds based on averages. In this way, the effective volumes of types of toilets, accumulation rates and household sizes are defined using averages for a region in a country to calculate the timely emptying threshold.

Table 4. Impact indicator – safe management of toilet contents **Source:** SNV SSH4A Performance Monitoring Guidelines, 2019 [2].

Impact indicator HH 6 (Households), Impact indicator SC 6 (Schools), Impact indicator HC 6 (Health facilities)	
4	Safe and timely emptying, and disposal Timely replacement of the pit or tank OR Timely and fully safe emptying of pit or tank: As level 3 below AND PPE is used AND no open transport AND disposal or reuse on site is safe
3	Partially safe timely emptying Timely emptying AND partially safe emptying (no pit entering, no open disposal in immediate living environment)
2	Timely emptying Timely emptying, but someone enters pit or disposal risks ground water contamination
1	Containment contaminating the living environment No timely emptying OR emptying not yet required but regular flooding OR timely emptying with pit contents disposed open into immediate living environment and/or unsafe re-use
0	No on-site containment No toilet or toilet discharges directly into environment

Practical insights about assessing safe (and unsafe) management practices

In applying the 'safe management of toilet contents' indicator (see Table 4), SNV first considers containment. If there is no containment, because the toilets discharge directly to a pond, drain to a closed or open drain, or to the street, it is considered unsafely managed (level zero).

Toilets classified as level one includes those whose contents indirectly contaminating the living environment, for example, because the pit floods regularly or because emptied pit contents are disposed of close by, or otherwise not safely re-used. If the toilet has never been emptied, the assessor must evaluate whether it has exceeded the timely emptying threshold, considering the age of the toilet, the dimensions of the pit and the size of the household. If the criteria are not met, the facility is classified as unsafely managed. As a result, the older the toilet, the more likely it is to be classified as unsafely managed if there is no sludge management (i.e. if nothing is done, it gets worse). This is a key divergence from the JMP classification, which does not consider toilet age. That the service level decreases with inaction, is an important motivator to improve faecal sludge management practices and services, ideally at the moment of construction of toilets.

Calculating the timely emptying threshold requires several assumptions to be made that apply for a given area or country. These assumptions vary due to the diversity of containment sizes within countries and a range of factors influencing sludge accumulation rates.

Moreover, the calculation assumes a constant sludge accumulation rate over time, while there is evidence that under the right circumstances, for older pits, the accumulation rate is much lower and slows with age. This means that the classification of toilets as past their timely emptying threshold is not intended to be used on an individual basis, because it is based on average size of containment for the area, rather than the individual pit dimensions.

If toilets are not emptied but they have not passed the timely emptying threshold, they are classified as safe. In addition, toilets which have had their containment replaced are classified as safe. It should be noted that groundwater contamination direct from the toilet pit is not evaluated under this indicator but as part of the functionality indicator. The reasoning is that groundwater contamination is largely the result of the construction of the toilet, not the management of the sludge. This issue is considered when the results are combined to produce a JMP comparable estimate.

Level 2 and level 3 are for toilets that are emptied in a timely manner, but the handling and disposal of their sludge is not fully safe. Due to the high risks involved, pit entering is singled out from other occupational health and safety (OH&S) aspects of emptying. Level 4 requires safe and timely disposal, considering also the use of PPE, no open transport and that any reuse is safe.

To summarise, a series of assumptions are used to classify toilets as safe using decision trees, and calculations are made based on data from sub-regions within countries. Data include household size, sharing prevalence, soil types, common toilet technologies, OH&S and solid waste practices.



Figure 13. Local toilet ring manufacturers in Savanakheth Province, Lao PDR.

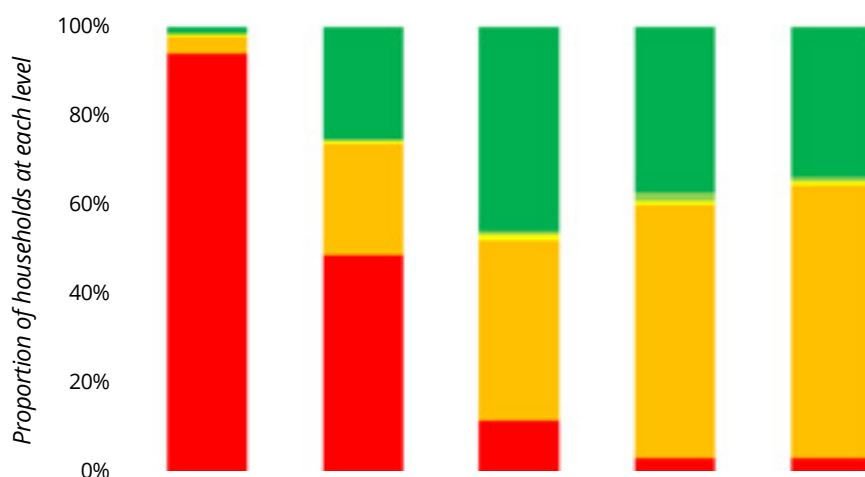
Use of monitoring data

Strengthening government-led monitoring is part of the specific governance component of SSH4A in which the focus is on alignment, application and use of nationally defined monitoring systems. SSH4A project monitoring is intentionally more detailed and disaggregated than national systems, because the data is used not only for comparison to standard measures (e.g. JMP, national surveys) but to tailor and adjust interventions and to facilitate learning with teams and government partners.

SSH4A program monitoring is performed annually, including for safely managed facilities, because this is seen as important to ensure adjustments can be made. For example, in Bhutan the review of data in 2018 was used to identify key risks to inform the development of the national Faecal Sludge Management Guidelines in the absence of national data. In 2020/21, the data relating to timely emptying then triggered the introduction of behaviour change communications for safe emptying as part of tailored post-ODF district strategies.

Regular SSH4A program monitoring can also generate data about the types of groups that are not progressing, for example, whether these are the poorest wealth quintiles (see Figure 14). Safe management data is disaggregated to the household level by wealth, gender (female-headed households, women's and girls' facilities), disadvantaged groups (ethnicity, other locally specific considerations) or people with specific needs (disability, old age), land ownership (landowners versus tenants), and geographical location (including informal settlements). For wealth disaggregation, SNV uses the asset-based index developed by the Demographic and Health Survey's (DHS) Program [4] and for accessibility, SNV uses the Washington Group Short Question [5], supplemented by focus group discussions and individual surveys. Both of these were chosen because they are already commonly applied in the sector, and wealth quintiles are used by JMP and within national level surveys. The limitation with DHS is that analysis generally requires more technical expertise than is available within country teams and needs to be supported by a regional or global advisor (who should also oversee data quality).

Safe management of toilet contents - by wealth quintile



Wealth Quintiles

Figure 14. Example of disaggregation by wealth quintiles to track the equity of progress **Source:** SNV Lao PDR Mid Term Performance Monitoring, 2020.

To ensure comparability of SNV data with national data or relevance for national targets, additional country-specific questions may be included to enable reporting on country-specific definitions, standards or norms. Norms such as latrine ratios in schools or sanitation service

standards in health care facilities are often locally defined. Where norms do not exist, SNV relies on World Health Organization norms. Country-specific questions might relate to predominant technology types or be designed to assess who is providing toilet emptying services.

Reflections

SNV's objective has been to contribute to good monitoring practice, whilst generating evidence to support development of safe management strategies in a particular context, in cooperation with government partners. The more detailed information collected permits review and reflection of the suitability of different monitoring approaches (e.g. in relation to timely emptying) and also the promotion and guidance of safe management informed by the data

(e.g. OH&S practices and risks). It also grounds assertions about use (e.g. in schools) and about accessibility (e.g. in health facilities). In some countries monitoring systems are extremely weak, lacking even reliable population data at the sub-district level. In these cases, it increases the value government and other partners may place on the importance of these data and the practical checks that can be done to ensure the quality of services.

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Acknowledgements

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About the author

Gabrielle Halcrow is SNV's multi-country manager for the SSH4A (rural) program in Asia. She has a technical background in international and environmental health, with 20 years of professional experience working with WASH, gender equality and public health programs with local and state governments and international development organisations. Her professional qualifications include a Master of International Health and a Master of Water and Environmental Management.



4. Monitoring Safe Rural Faecal Sludge Management and Onsite Sanitation Systems

Partner: iDE

Co-partners: University of Colorado Boulder, Causal Design Inc.

Country: Cambodia

KEY MESSAGES

1. iDE is improving rural faecal sludge management primarily through the sale of Alternating Dual Pit upgrades and an associated service offering treatment with hydrated lime. iDE has monitored the sale and delivery of over 15,000 Alternating Dual Pits through its project-connected sanitation enterprises.
2. To monitor safely managed onsite sanitation in rural markets, iDE recommends tracking faecal sludge management demand and supply, assessing household-level faecal sludge management practices and behaviours, household-driven monitoring of pit filling, and ongoing assessment of product effectiveness in the field.
3. To evaluate its progress towards SDG 6.2, iDE uses quantitative and qualitative monitoring tools including a real-time management information system, surveys of rural households, quality assurance audits, and cutting-edge faecal sludge management research.

Background

Organisation, partners and project

iDE's Sanitation Marketing Scale-Up (SMSU) program uses a human-centred design approach to develop and supply aspirational and affordable sanitation and hygiene products to rural households in Cambodia. The program trains local small businesses to manufacture, deliver and install these products. SMSU generates demand for these businesses' sanitation products through its sales team, which conducts door-to-door sales presentations to rural households. Since 2009, iDE's SMSU program has sold and delivered over 394,000 pour-flush pit latrines, supporting the rise in rural sanitation coverage in its six target provinces from 23% to nearly 80%.

Evidence-based decision-making has been foundational to SMSU's success. iDE has adopted monitoring and evaluation at every step to assess progress towards program goals and impact [1]. Most recently, iDE has been leading cutting-edge research in faecal sludge management (FSM) and climate change in Cambodia to further improve its intervention.

Case study context

Having achieved a marked expansion of basic sanitation coverage over the past decade, rural Cambodia is now faced with the urgent challenge of safe management of faecal sludge. In rural Cambodia, there are currently no economically or environmentally sustainable solutions for off-site treatment of human waste from full latrine pits. In addition, professional emptying services, such as vacuum pumping, are generally unavailable and/or too expensive for rural latrine-owning households. Despite some increase in availability of pumps and trucks in Cambodia, faecal sludge is handled and disposed of using unsafe methods in virtually all cases [2]. Therefore, safely treated and disposed in-situ is currently the preferred and recommended solution to achieve safely managed sanitation in rural Cambodia [3].

Since 2009, iDE has marketed and supplied the 'Easy Latrine' product, an offset pour-flush toilet that safely separates excreta from human contact (i.e. basic sanitation), to households in rural Cambodia. Access to hygiene is offered to households through a handwashing device integrated into iDE's latrine shelter designs. In 2017, iDE introduced the Alternating Dual Pit (ADP), an upgrade product based on a traditional alternating twin-pit design with two additional components: a pit gauge and a lime treatment service (Figure 15). Building twin pits enables the household to switch to the other when one pit fills whilst still using the same toilet and superstructure. The faecal sludge in the old pit decomposes, dries over time, and reduces exposure to fresh excreta. Dried sludge that has been left in an undisturbed pit for two years can be emptied safely [4], meeting the Joint Monitoring Programme (JMP) criteria for safely managed sanitation [3]. The waste from the pit can then be buried or used for agricultural purposes.

Through door-to-door sales presentations, iDE informs households about the cost-effectiveness, convenience of use, and community health impact of the ADP. In addition, all ADP customers receive an informational leaflet that recommends steps to take once the pit is full. As a result,

the ADP promotes FSM behaviour change and enables rural households to safely manage their faecal sludge on site. As of December 2021, 50 project-connected sanitation enterprises across five Cambodian provinces have delivered over 15,000 ADPs to rural households [5].

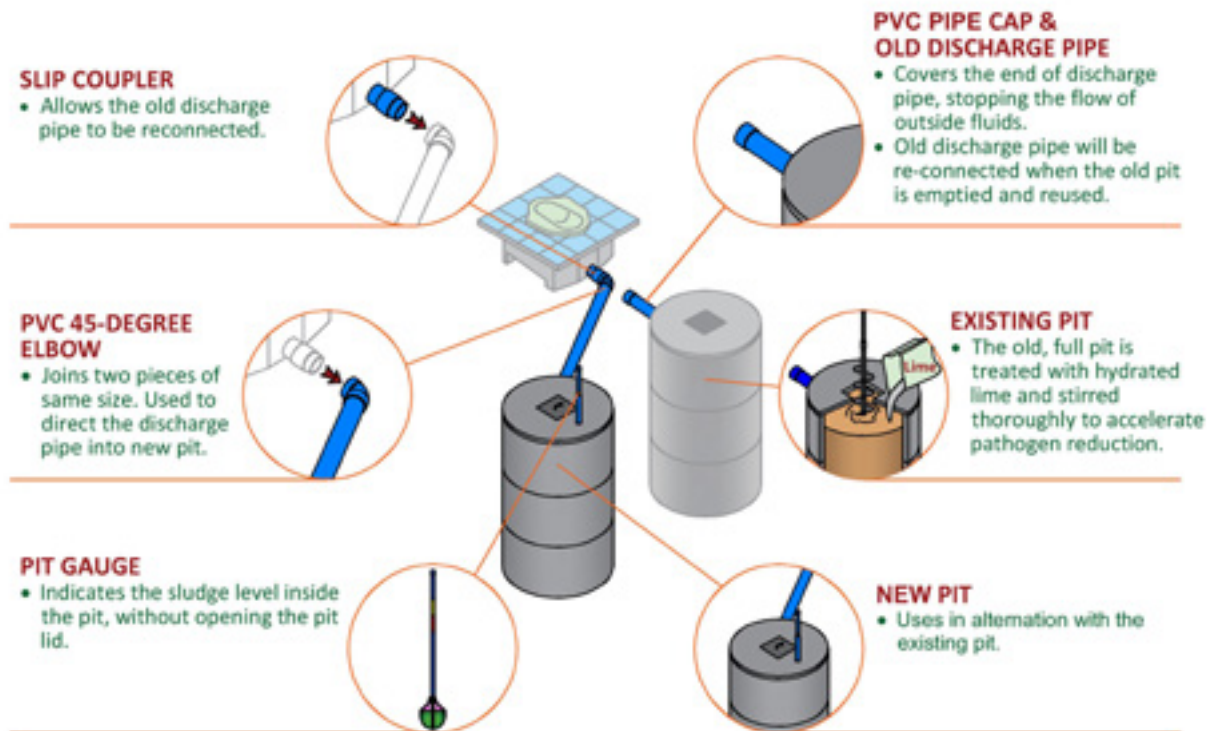


Figure 15. ADP installation guidelines [6].

Monitoring safely managed sanitation in a rural sanitation market

In this case study, iDE provides insights on the following key question: *What data is strongly recommended to be collected to monitor safely managed sanitation in a rural sanitation market?*

This case study first highlights the various tools iDE uses to collect and monitor FSM data. It then presents key collected data and provides examples of how that data is used to improve program outcomes and monitor progress towards safely managed sanitation, in line with SDG 6.2.

With an established network of project-connected sanitation businesses and an on-site FSM solution supplied at scale, iDE regularly collects and analyses the following data to improve access to safely managed sanitation in rural Cambodia.

1. **FSM demand & supply data**, including sales, actual deliveries, households' motivations to buy FSM solutions, and supply chain sustainability
2. **Household-level FSM practice & behaviour** data, including households' FSM knowledge, practices, behaviours and intentions, product use, and self-driven monitoring
3. **FSM product quality assurance** data, including customers' satisfaction with the product, the functionality of the onsite FSM systems in the field, and the efficacy of those systems in reducing pathogens to safe emptying levels.

Monitoring tools for safely managed sanitation

iDE recommends a combination of data collection and management tools as well as research and development efforts to monitor rural sanitation markets. iDE has deployed the following tools to understand the safely managed sanitation context and the program's impact:

- **Real-time data collection and management information system (MIS).** Sales and deliveries of onsite sanitation and FSM products are reported into a Salesforce-based MIS. The data is verified in the field and updated regularly, allowing iDE to create real-time dashboards and data monitoring reports. This MIS has been crucial to track program operations at scale, enabling iDE to optimise its supply and demand-focused activities to reach as many households as possible with sanitation products like the ADP.
- **Customer survey.** An ongoing follow-up survey is conducted with latrine customers (after 12 to 18 months of ownership) to monitor intra-household use and product satisfaction. The latest version, deployed in June 2021, targets ADP customers allowing further understanding of rural households' FSM knowledge, practices, and proper use of the onsite FSM solution. This data is used to improve products and services, ensuring that products like the ADP are meeting customer needs.
- **Quality assurance checks.** iDE staff complete routine quality assurance checks for roughly 20% of new customers in order to identify and help solve technical challenges in the field. If a prominent issue is detected, iDE uses additional tools such as a call centre to quickly understand the scale of the issue and take the appropriate measures to fix it. This tool is another key method for identifying areas of product improvement, allowing iDE to ensure that products are durable enough to enable long-lasting sanitation behaviour change.
- **FSM survey.** In partnership with the University of Colorado Boulder, iDE designed and conducted an FSM survey to better understand household-level FSM decision-making and practices. The survey, including a novel discrete choice experiment (DCE) module [7], was administered to 1,461 households to characterise rural households' behaviours, attitudes, knowledge, and preferences for FSM across five provinces. The FSM survey provided insights that can help the Cambodian WASH sector to develop FSM products and services that meet customers' needs.

- **ADP efficacy study.** In partnership with Causal Design Inc., iDE is developing research to assess whether the ADP product can effectively reduce the presence of pathogens in pit latrines, and whether it is used correctly at the household level by alternating and emptying pits at the recommended interval. This research will be completed by the end of 2022. It will reveal the efficacy of the ADP product in Cambodia and enable iDE and the sector to provide safely managed sanitation sustainably.

Monitoring FSM demand and supply

Sales and deliveries

iDE's sales team tracks demand generation continuously by reporting the sales figures for each province weekly (Figure 16). The weekly sales reports include the total sales by product, sales agents' closing rates, and percentage of targets met. In addition to monitoring operations, by collecting this data, iDE found that ADP sales increase during the rainy season (Q3: Jul to Sep & Q4: October to December) when households experience problems with their latrines, including difficulties with flushing, smell, and pit overflow.

Interestingly, this trend is the opposite to that for sales of basic sanitation products like iDE's Easy Latrine, which achieve the highest sales in the dry season when household spending power is high after harvest. This indicates that households have a clear need for FSM and will pay for it, even in economically unfavourable periods of the year.



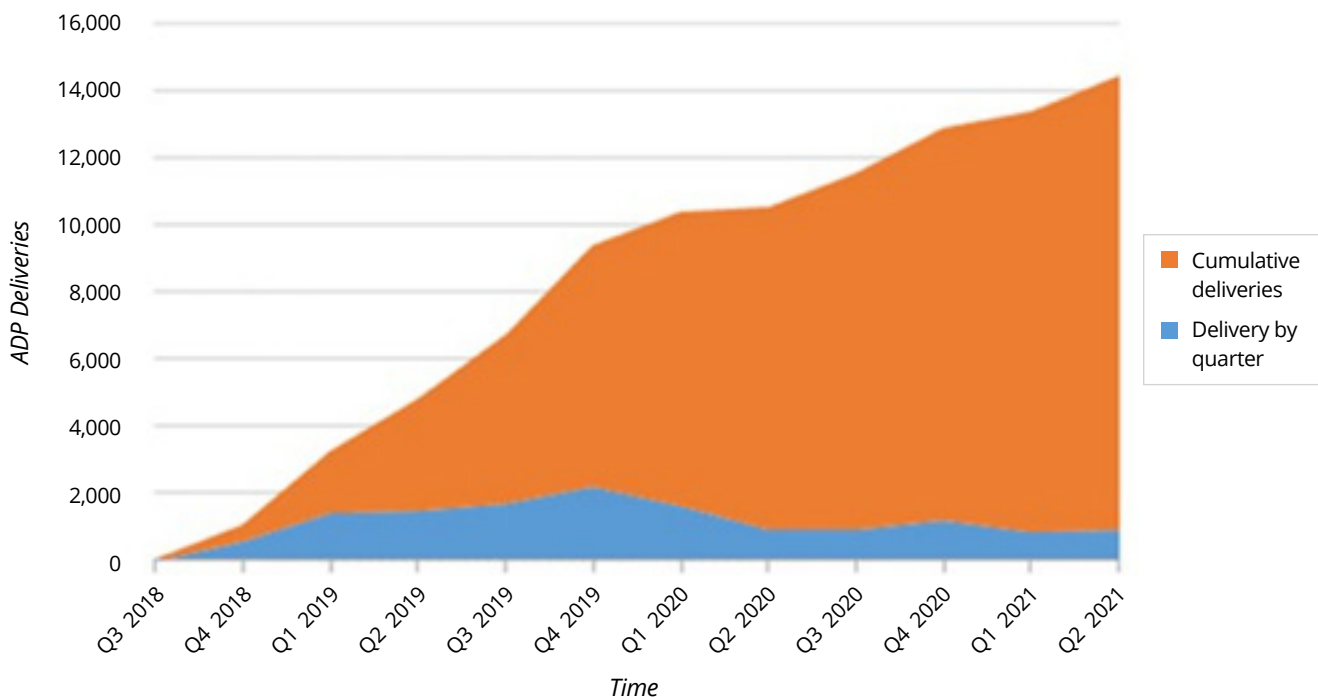


Figure 16. Cumulative and quarterly iDE project-connected ADP deliveries.

Households' motivation to buy an FSM solution

After 12 to 18 months of ADP ownership, iDE follows up with customers to collect information on their profile and motivations for buying the FSM product, asking 'Why did your household decide to purchase this iDE product?' Investigating reasons behind purchasing enables iDE to get a better understanding of intra-household decision-making dynamics and agency. This can help the program to assess if it is meeting the needs of all of the members of households who buy latrines. iDE found that most of our customers who purchased ADPs are ones who owned a pit that was almost full or full. Another learning is that convenience and security are the most commonly cited reasons for deciding to buy a latrine, not health concerns. Furthermore, iDE found that women are key players in the decision to finance and purchase a latrine: over 31% of iDE customers say that purchase decisions were driven by the wife, and 75% report that purchases were financed either by the wife or by husband and wife jointly.

In addition, iDE records the rate at which households cancel their orders and the reasons behind it. Typically, financial issues are the main reason for cancellation. To remove this barrier, iDE initiated a simple, zero-interest payment instalment plan for its ADP customers.

In partnership with the University of Colorado, Boulder, iDE deployed a study that included a DCE module [7]. A DCE is used to quantitatively gauge customer preferences among a set of product/service characteristics. Through this research,

iDE found that rural households prioritise preventing contact with faecal sludge of all the tested FSM service attributes, followed by reducing foul odour and producing fertiliser from faecal sludge (Figure 17).



Figure 17. Household preferences for rural FSM-service attributes in Cambodia [7].

WASH supply chain sustainability

In iDE target areas of rural Cambodia, sanitation rates have been increasing steadily. This means that households that installed toilets for the first time a few years ago are finding that their pits are starting to become full. Therefore, sanitation businesses must consider how they can diversify their inventories and anticipate future demand for other sanitation products. In particular, latrine businesses offering FSM solutions such as the ADP upgrade are more likely to stay profitable [8].

Monitoring FSM practices and behaviours

Households' FSM knowledge, preferences, intentions, and behaviours

In 2019, iDE assessed rural households' knowledge, preferences, intentions and behaviours towards FSM. A questionnaire was administered to 1,472 rural households that had owned a pour-flush latrine for more than two years. This sample was selected to be representative of households who are likely to have considered or experienced some level of FSM decision-making because their pits were likely to have filled up. The research findings (summarised in iDE's Mid-Term Report [1]) deepened the understanding of the current and potential market context for FSM products and services, enabling iDE to improve its approach for increasing access to safely managed sanitation in rural Cambodia.

By plotting the FSM survey data against flood incidence maps, iDE explored the link between climate vulnerability, latrine functionality, and the FSM intentions and practices of rural households [9]. Findings showed that with increased flooding across iDE's operational areas, more dysfunctional latrines can be expected, which will amplify the potential for unsafe FSM behaviours and practices. Unsafe FSM measures include releasing faecal sludge into the open environment by opening the pit lid during a flood, putting a hole in the pit wall, or stopping latrine use and reverting to open defecation. iDE intends to use these insights to target sanitation-challenged areas and increase households' WASH resilience against increasingly extreme seasonal climate change shocks.

iDE regularly uses its customer survey mechanism to evaluate households' FSM knowledge and understanding of the benefits of an onsite FSM solution. Key questions include *'What are the advantages of the ADP?'* and *'What are the advantages of lime treatment?'* iDE found that there is an overall lack of knowledge about FSM. Improving knowledge and familiarity with ADPs, safe emptying practices, and any other FSM intervention in rural Cambodia could drive safer household decision-making and improve acceptance of safe FSM behaviours, products and services.

Product use

iDE conducts follow-up interviews with customers to monitor households' use of sanitation products and their handwashing practices, ultimately evaluating progress toward safely managed sanitation. In reference to each individual family member, iDE asks *'When at home, how often does the household member use the latrine?'*; *'Is there soap near the handwashing device or area?'*; *'Is there water near the handwashing device or area?'* In addition, the customer survey staff look for signs of latrine use. iDE staff observations include a well-worn path between the house and the latrine facility, signs of wear around the pan, cleaning agents inside the latrine (broom, water container, bleach), and slippers outside or inside the latrine.

iDE's most recent project evaluation (summarised in iDE's Mid-Term Report [1]) found that latrine usage rates in Cambodia are similar for men and women, while the elderly and people with disabilities have the highest usage rates (around 79% of people in both groups report always using the latrine). Taken together, these findings indicate a high degree of equity in access to and use of sanitation facilities in project areas.

Within the next year, iDE will administer a scaled-up behavioural quantitative study targeting ADP customers to further understand if the on-site FSM technology is being used appropriately at the household level by alternating and safely emptying pits at recommended time intervals.

Household-driven monitoring

The ADP product includes a pit gauge that functions like a visual alarm clock, signalling to a household when its pit level is approaching capacity (Figure 18). By drawing the household's attention to its latrine pit contents in a conspicuous way, iDE's intention is for the pit gauge to nudge the household to start considering FSM options before an emergency arises. During the ADP six-month pilot in 2018, iDE recorded whether the pit gauge product triggered households to buy an ADP. The research yielded qualitative indications that the pit gauge helped to increase ADP sales, but the quantitative assessment was inconclusive.

Currently, iDE is gathering data on ADP customers' proper use of the pit gauge and the durability of this self-monitoring tool in the field. Households are asked *'What is the advantage of the pit gauge?'* and pit gauges are observed in the field to check if they are still functional (i.e. the visual indicator moves up and down freely).

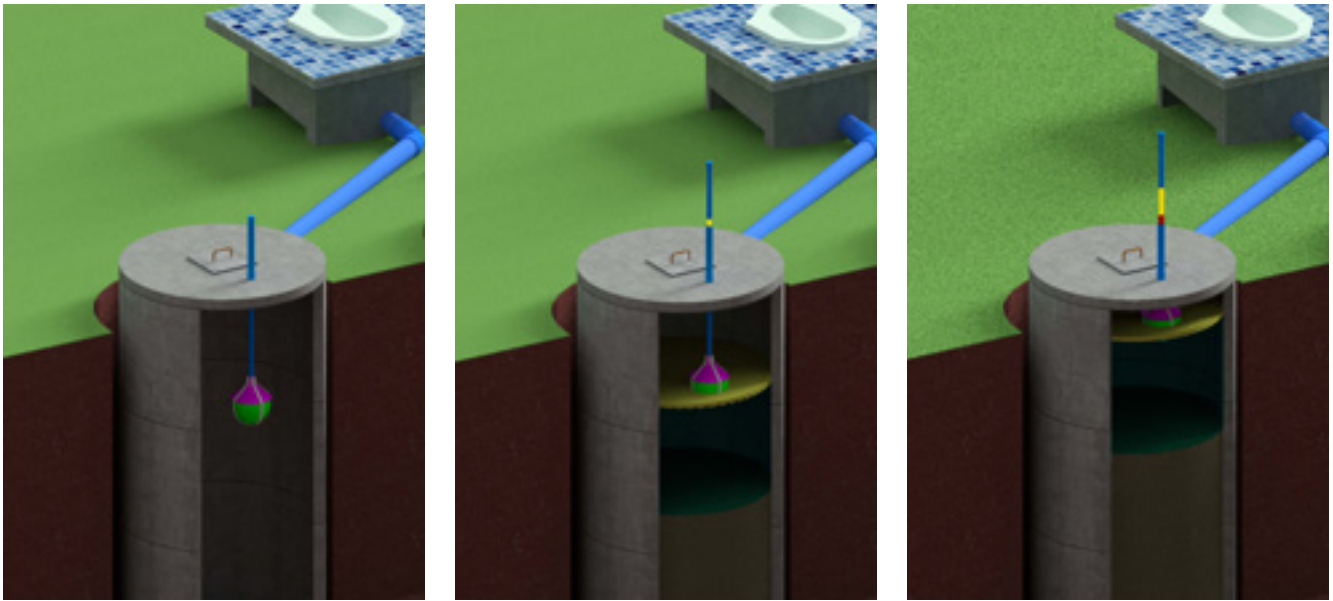


Figure 18. The pit gauge: A nudge towards FSM behaviour change.

FSM product quality assurance

Customer satisfaction

To ensure that the household will continue to buy and use FSM products, iDE collects data on customers' satisfaction with both the FSM product and the installation service provided by the sanitation business supplier. Key questions include 'How satisfied are you with the product?'; 'How satisfied are you with the service you received from your product supplier?' and 'On a scale of 1–10, how likely are you to recommend this product to someone who does not yet own one?'.

FSM product functionality challenges

iDE staff complete routine quality assurance checks of installed products in the field to monitor any technical challenges. If the quality assurance field officer detects major functionality or technical issues within six months of installation, the sanitation business supplier is asked to fix the issue. In this way, iDE identified cases of ADP upgrade pits filling prematurely, which prompted us to conduct a systematic survey of the ADP client base across the five target provinces.

Using a call centre, iDE deployed a questionnaire to a random sample of 1,750 ADP owners and 1,750 owners of the Easy Latrine (iDE's standard pour-flush latrine product) to compare the proportion of these two products filling up within 1.5 years of installation (considered premature,

because a typical pit for a toilet used by one family should last at least two years). Preliminary findings have shown that about 25% of ADPs filled prematurely, while only 6% of Easy Latrines filled prematurely. The discrepancy in premature pit filling incidence rates between the two products is not believed to be related to any product design defects, because the ADP uses the same pit design as the Easy Latrine. iDE's two current working hypotheses to explain these findings are:

1. iDE is more likely to sell ADPs to people whose existing latrine pit has filled up prematurely because they live in environments with dense and saturated soil (e.g. clay) and/or a high groundwater table.
2. The ADP upgrade pit is installed too close to the original pit (less than the 1.35 metre design standard), causing a reduced infiltration zone for the new pit due to clogged soil around the old pit.

With these hypotheses in mind, iDE aims to improve its ADP sales and installation processes to reduce the likelihood that ADPs will be installed in challenging environments that impede their functionality. Furthermore, iDE is designing a three-month sales trial for the All Season Upgrade product [10], a septic-tank-like modification to a standard latrine pit, which aims to increase the resilience and functionality of household toilet systems installed in dense, saturated soils and/or high groundwater areas.

Reflections

In order for a household to safely and sustainably manage their sanitation, decision-makers must have knowledge of the importance of FSM, affordable access to appropriate products/services, and incentives and tools for proactively monitoring their situation and making timely FSM-related decisions. To assess whether these factors are in place, iDE recommends that when conceptualising safely managed sanitation monitoring, the following dimensions should be included:

- Assessment of household knowledge, preferences, intentions and behaviours
- Household-driven monitoring to prevent unsafe decision-making and prompt, timely action
- Evaluation of product/system functionality and effectiveness, especially in areas that are most affected by climate change (e.g. flood-prone areas).

iDE recommends that tools to assess safely managed sanitation utilise both quantitative and qualitative methodologies and prioritise user-centred, context-driven approaches. These tools should also promote continuous quality improvement in effective monitoring of progress towards safely managed sanitation.

To further contribute to effective safely managed sanitation monitoring in rural Cambodia, iDE seeks to reach a sector consensus on the efficacy of onsite FSM products, such as the ADP with lime treatment, in reducing pathogens to safe emptying levels. In 2022, iDE will evaluate – in real-world conditions and at scale – the biology of the ADP and related household behaviour. *Escherichia coli* and *Ascaris ova* (helminth egg) viability in 180 used pits will be enumerated to test if lime-treated pits can be emptied safely after the World Health Organization-advised two years of storage treatment [4], and to determine the period of time after which lime-treated pits can be emptied safely without specific techniques or equipment. iDE will also survey how households operate and maintain their ADPs compared to recommended practices. The results of this research will enable iDE and the sector to evaluate and monitor progress towards safely managed sanitation more effectively.



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About the author

Rana Abdel-Sattar is the WASH Innovation & Partnerships Manager with iDE Cambodia. Rana has a technical environmental engineering background with a focus on WASH. In her role at iDE Cambodia's SMSU program, she supports strategic decision-making for program operations, oversees the development and introduction of new WASH products and services into the program, manages the national engineering team, creates and strengthens partnerships with the sector, and develops and disseminates program knowledge. Rana is leading cutting-edge research on FSM and climate change in the context of rural Cambodia.



University of Colorado
Boulder



5. Embedding Safely Managed Sanitation Monitoring in Government Systems in Bhutan

Partner: SNV Netherlands Development Organisation (SNV)

Co-partners: Public Health Engineering Division (PHED) of the Royal Government of Bhutan's Ministry of Health (MoH), University of Technology Sydney, Institute for Sustainable Futures (UTS-ISF)

Country: Bhutan

KEY MESSAGES

1. Applying risk-based assessments that draw on a combination of data sources can help decision-makers to identify priority issues and inform safe management practices, technology choices and guidance.
2. In the absence of nationally representative data on safely managed sanitation services in Bhutan, there is value in using available national sanitation data, program data and field knowledge on safely managed services, and insights from stakeholder workshops to inform national assessments and target setting.
3. Embedding, alignment and harmonisation of national monitoring systems with safely managed service objectives is a long-term process, supported through efforts that build buy-in, experience and commitment within government.

As a district-wide phased approach, the project is seeking to progress equitable, universal access to safely managed sanitation and hygiene by scaling up the government's national Rural Sanitation and Hygiene Programme (RSAHP) to four additional districts and strengthening safely managed services across four ongoing program districts. This includes supporting the government to look beyond the 'finish line' of open defecation free (ODF) status to consider safe emptying practices and strengthen inclusive governance and regulation.

Case study context

Bhutan has aligned its National Key Result Areas for its 12th Five Year Plan (2018–23) with the WASH Sustainable Development Goal (SDG) 6 indicators. The National Sanitation and Hygiene Policy of 2020 also expresses the intention to achieve universal coverage and access by ensuring safely managed sanitation services for all [1]. However, one of the more challenging issues while transitioning from the Millennium Development Goals to the SDGs has been the absence of reliable national baseline data to track the SDG6 WASH-related 2030 targets and commitments.

Background

Organisation, partners and project

SNV is a not-for-profit international development organisation. Since 1988, SNV has been designing scalable and impact-oriented programs within the agriculture, energy and water, sanitation and hygiene (WASH) sectors in Bhutan. Beyond the Finish Line – Sustainable Sanitation and Hygiene for All (SSH4A; see Figure 19) is a five-year multi-country program (2018–22), implemented by SNV in Bhutan and Nepal. In Bhutan, it is led by SNV together with the PHED, local government authorities, national civil society partners, including Ability Bhutan and the Bhutan Association of Women Entrepreneurs, and small-scale private sector actors. Knowledge and learning activities are supported through a multi-country partnership with UTS-ISF and CBM Australia.



Figure 19. Beyond the Finish Line Program Model – Phase 2
Source: SNV, 2018.



Alden Dockery, SNV Bhutan

Figure 20. Toilet construction in remote mountain villages.

In Bhutan, 62% of the population live in rural mountainous settings, with 84% of rural households having access to improved sanitation in 2020 (Figure 20). The latter proportion is increasing steadily as part of the scaling up of the government’s RSAHP to achieve a national target of ODF via 100% access to improved sanitation facilities by 2022 [2]. It is estimated that 95% of rural Bhutanese households are not accessible by vacuum tanker trucks. In addition, the absence of mechanised faecal sludge emptying service providers in rural mountainous Bhutan makes it difficult to remove faecal waste from onsite facilities and transport it for treatment and disposal elsewhere. For that reason, for the foreseeable future, safely managed sanitation in most of rural Bhutan can, to a large extent, only be realised by exploring and promoting options involving human excreta being treated and safely disposed in situ [3].

Whilst data on basic sanitation in rural areas is available, there is no nationally representative government data on safe emptying, transport and treatment of faecal waste. This posed a challenge for decision-makers in setting the national target for safely managed services.

The RSAHP is based on SNV’s SSH4A program, which was endorsed as the national approach in 2011. As part of SNV’s project, safely managed sanitation data has been

collected annually from rural households since 2014 and for schools, health care facilities and institutional settings since 2018. Data collection covers eight of the country’s 20 districts, and as detailed below, considers additional dimensions of timeliness of latrine pit emptying and occupational health and safety (OH&S). The experience from this data collection and analysis supported the national agenda.

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Pathway to a national monitoring systems and processes

Monitoring data provide evidence that can guide the planning and investment needed to achieve Bhutan's national safely managed sanitation commitments. To progress this, there have been a series of key steps towards establishing baselines, setting targets and strengthening the existing monitoring systems. These steps involved national-level stakeholder processes, drawing on insights from existing datasets that complement the Joint Monitoring Programme (JMP) data, and undertaking national assessments (including toilet observations and efforts to embed in. These steps are discussed below.

As a first step, a World Health Organization (WHO) JMP Consultant facilitated a national WASH stakeholder consultation meeting (Sept 2017) to establish a national WASH baseline aligned with SDGs 6.1 & 6.2, and to set realistic national targets to work towards achieving safely managed WASH for all by 2030. The process identified all existing data that could be used for the WASH SDG baselines, as well as data gaps and recommended methodology to address them, including coordination amongst sectors and strengthening monitoring systems. The key gaps in data and knowledge related to the emptying of pit latrines and septic tanks. The JMP's approach to classification of household sanitation facilities focuses primarily on the toilet and slab type, and the number of households using the toilet, rather than the safe management of the excreta [4].

The monitoring of SNV's project 'Beyond the Finish Line – Sustainable Sanitation and Hygiene for All' is guided by the SSH4A Performance Monitoring Guidelines that assess indicators using survey tools that have been tested in Bhutan since 2014 as part of SNV's harmonised global monitoring system [5]. SSH4A indicators separately assess expanded indicators that can be merged into a single ladder similar to the JMP service ladder. The key differences are that SSH4A indicators also include aspects of functionality, use and maintenance, the environmental safety of the toilet, and safe management, including timeliness of emptying and OH&S aspects.

In 2018, a workshop with PHED, was facilitated together with IRC and SNV along with representatives from the Ministry of Works and Human Settlements' Urban Water and Sanitation team and monastic institutions [6]. The process relied on existing data (from the national census [7] and SNV SSH4A data), along with field knowledge gained as part of the national RSAHP relating to types of toilets, designs, structures, emptying methods etc. Its objective was to estimate the levels of access to rural safely managed sanitation, assuming current practices in pit construction and handling of faecal waste during emptying, transport and disposal within various contexts in Bhutan. The process generated rural shit flow diagrams (Figure 21), more commonly used in urban settings, at both the national program level and within SNV's program districts [8]. These diagrams illustrate the proportion of the population's excreta that is managed safely, based on current faecal waste management practices. These diagrams allowed decision-makers to identify major risk areas and develop interventions to improve the prevalence of safely managed sanitation systems.

Using the JMP 2017 data along with pit emptying, transport and treatment data and practitioners' knowledge from SSH4A program areas, the assessment of safely managed sanitation using the shit flow diagram approach, estimated that 39% of faecal waste in rural Bhutan was managed safely (Figure 21). This estimate was significantly higher than earlier estimates calculated with the available JMP data alone, without the benefits of local knowledge and the more detailed SSH4A survey data. The major faecal exposure risk was due to the use of unimproved toilets, while the use of water for anal cleansing in dry pit toilets and unsafe emptying or disposal of wet faecal sludge from septic tanks and soak pits constituted a minor faecal exposure risk.

Understanding the specifics of sludge accumulation and pit management for wet and dry pits was essential to define pathways towards safely managed sanitation. It highlighted the importance of combining technical design criteria and appropriate survey data, grounded in knowledge of common practice. The outcomes of this workshop supported the MoH's development of the Faecal Sludge Management Guidelines 2019 and increased buy-in nationally.

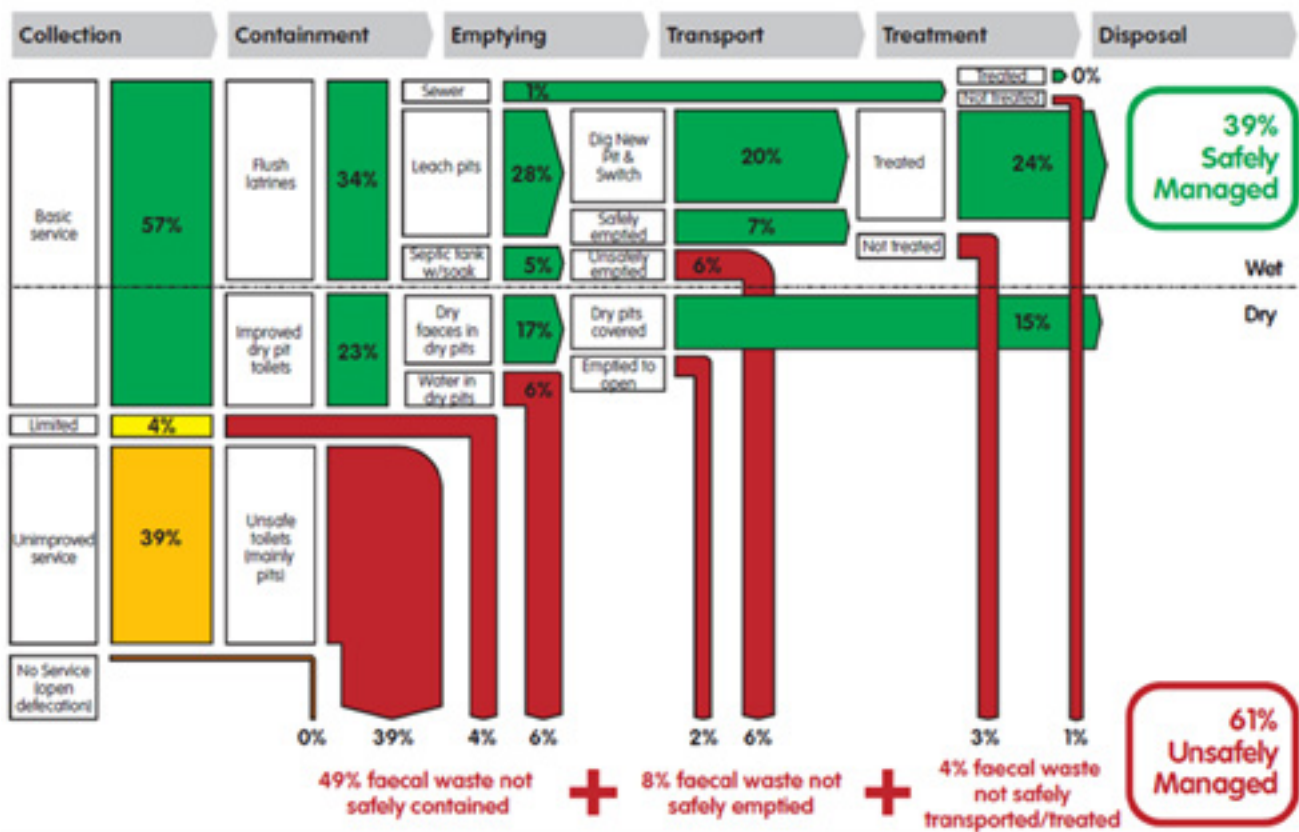


Figure 21. Safely managed sanitation estimates, rural Bhutan [6].

In 2018, PHED, with technical support from UNICEF and SNV, conducted a national sanitation survey to establish a rural baseline for safely managed sanitation. The survey questionnaire was informed by SNV's existing survey tools and JMP core questions. The survey was carried out by trained health workers but change in staff and gaps in capacity to analyse the data have meant that the findings remain unpublished. The key questions incorporated within the national baseline survey for sanitation were as follows.

- Has the pit ever been emptied?
- The last time it was emptied, where were the contents emptied to?
- What safety measures were taken into consideration while emptying the pit?
- For a household with a member with disability, is the toilet accessible?
- For a household with a member with disability, if the toilet is not accessible, how do you manage their toilet needs?

While the survey tools have been developed and tested, the government is yet to incorporate these questions in the national Health Management and Information monitoring

system or to set a national safely managed sanitation target. To date, the only available data on safely managed sanitation in Bhutan is that collected annually by SNV. This information is shared with the national program, including through the recent mid-term review process. Some results from the project mid-term monitoring survey are illustrated in the following findings [8].

- 92% of families use a pour-flush latrine
- 91% of toilets are connected to a single pit, including direct pits (7%) or offset pits (84%)
- Toilets appear to fill up very slowly – only 1% have been emptied so far
- On average pits are emptied after 11 years, but only 3% of toilets older than 11 years have been emptied
- No service providers in rural Bhutan can empty faecal waste containments mechanically.

These findings reaffirm the value of the national RSAHP approach of promoting toilet designs that meet 'basic' sanitation criteria such as twin pits (see box below), yet over time can be upgraded relatively easily (Figure 22) to meet safely managed sanitation criteria, in particular disposal in situ.

Appropriate technology options

Dry toilets will remain an important technology option for rural areas of Bhutan, so minimising moisture introduced into dry pits is crucial for effective aerobic processes, and reduces the risk encountered during pit emptying. In rural areas, emptying wet faecal sludge from septic tanks will always be difficult and risky in the absence of mechanised services. As such, twin pits are being promoted as a superior technology option to septic tanks and single leach pits in this setting. When the first pit is full, it is left covered, and the pan connection pipe is switched to discharge to the second pit. By the time the second pit is full the contents of the first pit should be safe enough to be removed manually and reused, much like compost, to improve soil conditions and fertilise crops. Under normal conditions the (decomposed) content of a pit can be removed safely after two years [10], and therefore the pits are sized more conservatively than single pits built for extended filling intervals. Alternating pits are also suited to the more permanent superstructures commonly being used.

Challenges of integrating safely managed into national monitoring

Safely managed sanitation (SMS) is a relatively new concept in the rural WASH sector. As noted earlier, PHED, in partnership with SNV and UNICEF, developed SMS survey tools, but these have not been integrated into the national Druk Health Information System (DHIS2). Change or integration of new information into the DHIS2 takes place every five years, with the MoH implementing a strict screening procedure. To date, basic sanitation has been monitored using nine questions, answered primarily by direct observation [9]. For SMS in rural areas of Bhutan, the addition of the five questions listed above is recommended. To obtain higher-quality data, the enumerators need more training in data collection, which requires more time and cost.

Finally, integrating questions relating to safely managed sanitation in national surveys such as the Bhutan Living Standard Survey (every five years) and the Population and Housing Census (every 10 years) would facilitate the linkage of data on sanitation and wealth quintiles, gender and social inclusion.



Figure 22. Installation of diversion chamber as an effective approach to safe faecal sludge management in rural communities.

Reflections

In the absence of nationally representative data on safely managed sanitation services, experience in Bhutan has shown the value of using available national sanitation data, program data and field knowledge to inform national assessments and guide the embedding of better questions in monitoring systems. Regular analysis with national stakeholders using tools such as the shit flow diagram, based on available data and field knowledge of faecal waste management practices, supports monitoring, identification of changes needed (e.g. technology choices), and the development of national guidelines on sludge management.

Ideally, the Government's monitoring system should align with the JMP core indicators and provide insights into final disposal of faecal waste (safely contained onsite, safely emptied and disposed or reused onsite, safely emptied, transported, treated and disposed of or reused offsite). Such information will support realistic target setting and guide further intervention strategies. Embedding, aligning and harmonising national monitoring systems – including the MoH's DHIS2 – with safely managed service objectives is a long-term process, requiring considerable buy-in and commitment.

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Acknowledgements

Beyond the Finish Line is a five-year rural WASH program (2018–22) implemented in Bhutan, Lao PDR and Nepal. Supported by the Australian Government's Water for Women Fund, the program strengthens WASH services by making them more inclusive, accessible and sustainable through the application of gender equality and social inclusion approaches.

About the authors

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6. Safely Managed Data for Government Monitoring and Decision-making

Partner: WaterAid

Country: Papua New Guinea (PNG)

KEY MESSAGES

1. In Wewak District, PNG, government officers typically prioritise delivery of services to a minimum basic level rather than a safely managed level. There are significant opportunities to increase knowledge and awareness of safely managed services.
2. Analysis of Sustainable Development Goal service levels is time-consuming and complex. RapidWASH is a tool developed to streamline analysis processes, delivering data to decision-makers in a timely manner and usable format.
3. A culture of reflection, sharing and learning is an important factor for promoting government decision-makers to engage with and use data on safely managed services.

Background

Organisation, partners and project

Monitoring water, sanitation and hygiene (WASH) progress (towards universal services) and performance (against sector policy and strategy indicators) is complex. This complexity can lead to confusion amongst stakeholders on what to measure, how to measure, and how to interpret the results. The Sustainable Development Goals (SDGs) contain service level ladders for global tracking and reporting of WASH services. Safely managed water and sanitation services sit at the top of the SDG service level ladders and require more supporting data than lower service levels. Collection, management and analysis of this data is a recognised challenge for the WASH sector, requiring significant data inputs, human resources and capacity.

To help streamline data collection and analysis processes, and transfer data to decision-makers quickly, WaterAid Australia – in partnership with IRC and mWater – developed the RapidWASH assessment tool as part of the

Australian Government's Civil Society WASH Fund. The system was further adapted in 2018 under the Australian Government's Water for Women Fund. RapidWASH 2.0 is a free and open-access system consisting of smartphone-based data collection (through the mWater surveyor platform) and a management portal that analyses WASH data automatically. RapidWASH 2.0 is used for assessing and tracking performance of WASH service delivery projects.

Case study context

Wewak district, located on the north coast of PNG, is home to 107,000 people. Wewak town is the only urban centre in the otherwise rural district, which includes many remote communities accessible only by combinations of car, boat and long journeys on foot.

At the beginning of the Water for Women project in 2017, WASH decision-makers in Wewak district had little data on WASH access or service levels. WaterAid has been working with decision-makers from East Sepik Province, Wewak district and Wewak's five rural and one urban local level governments (LLGs) to collect, analyse and use data on water, sanitation and hygiene in communities, schools and health centres to create and implement a district-wide five-year plan for strengthening governance arrangements and improving WASH services.

Translating project-based monitoring into government monitoring systems

While safely managed water and sanitation services sit at the top of the Joint Monitoring Program (JMP) ladders, in many contexts safely managed services are somewhat aspirational. For instance, in PNG, government priorities and service delivery align with the SDG basic services. Awareness of the SDGs and the associated service ladders at subnational level remains low, and resources for monitoring and providing services are scarce and contested within the context of many development priorities. Limited resources for monitoring, low SDG awareness and a lack of human technical capacity means that data gaps are common.

The provision and monitoring of safely managed sanitation and water supply services require more household-level data than other services. Monitoring safely managed water supply requires water quality testing, while safely managed sanitation requires evidence on the effectiveness of the sanitation service chain. Where such data is collected in PNG, it is seldom entered into a usable system or analysed effectively.

RapidWASH 2.0 aims to reduce these bottlenecks through the standardisation of indicators, automated analysis and timely information sharing to increase collaboration, programmatic response and course correction. RapidWASH2.0 has been used successfully in WaterAid's joint service delivery approaches with the Government of PNG in Wewak District. WaterAid sought to answer the question: *How can project-based monitoring of safely-managed WASH services be translated into government monitoring systems and their use of monitoring data?*

About RapidWASH 2.0

The RapidWASH 2.0 platform consists of a web-based management portal with integrated smartphone data collection via the mWater surveyor app. Two globally applicable survey questionnaires (household questionnaire and community/WASH community questionnaire) are deployed to people undertaking a service delivery project.

While both questionnaires are globally applicable, RapidWASH users are free to contextualise them by adding questions.

The community survey is then undertaken with the community WASH committee (or nominated community representatives if there is no WASH committee). The RapidWASH household survey is undertaken with every household involved in the service delivery project. For larger projects, a sample-based approach can also be employed. The questionnaires can be translated into local languages and users can toggle between languages as they wish.

Data is automatically transferred to the RapidWASH management portal, where SDG and safely managed service levels are displayed automatically (Figure 23). A mobile network is not required to collect data, but is required to transfer data back to the RapidWASH management portal.

The RapidWASH surveys can be conducted at four phases (depending on the project): baseline (pre-implementation), midline (project construction/progress tracking), endline (post-implementation) and monitoring (follow-up post-implementation support). Figure 24 shows how service levels are easily comparable in such longitudinal monitoring; specific colours represent the service level households in the community receive at each point in time.

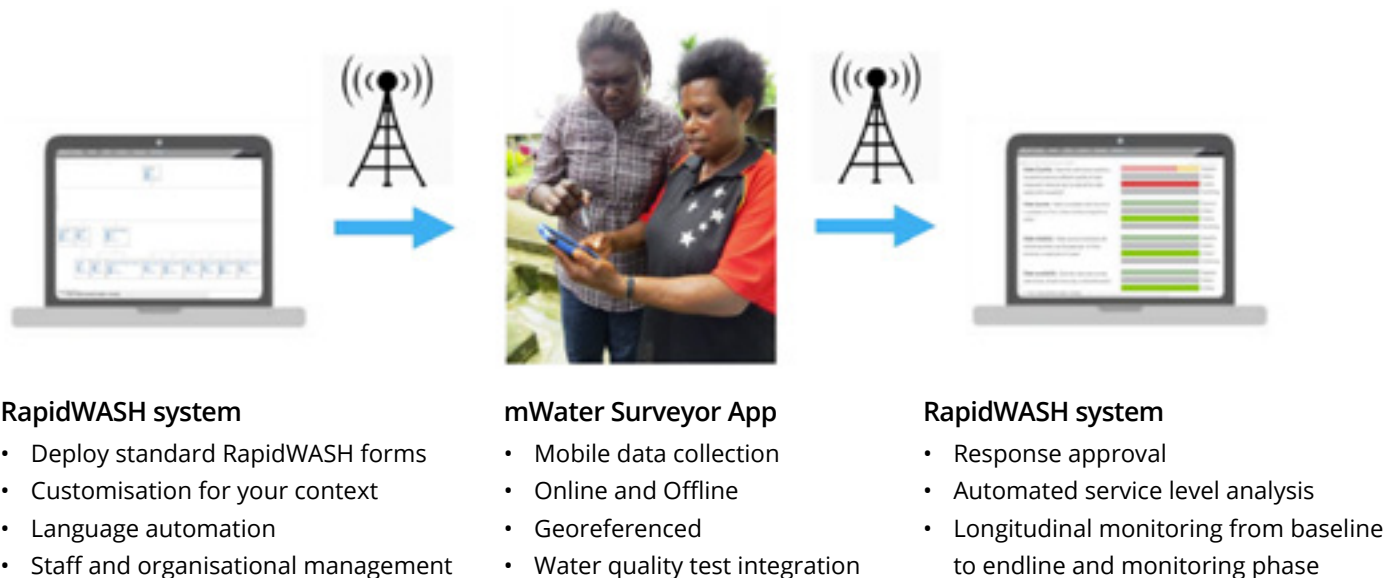


Figure 23. RapidWASH2.0 data flow.

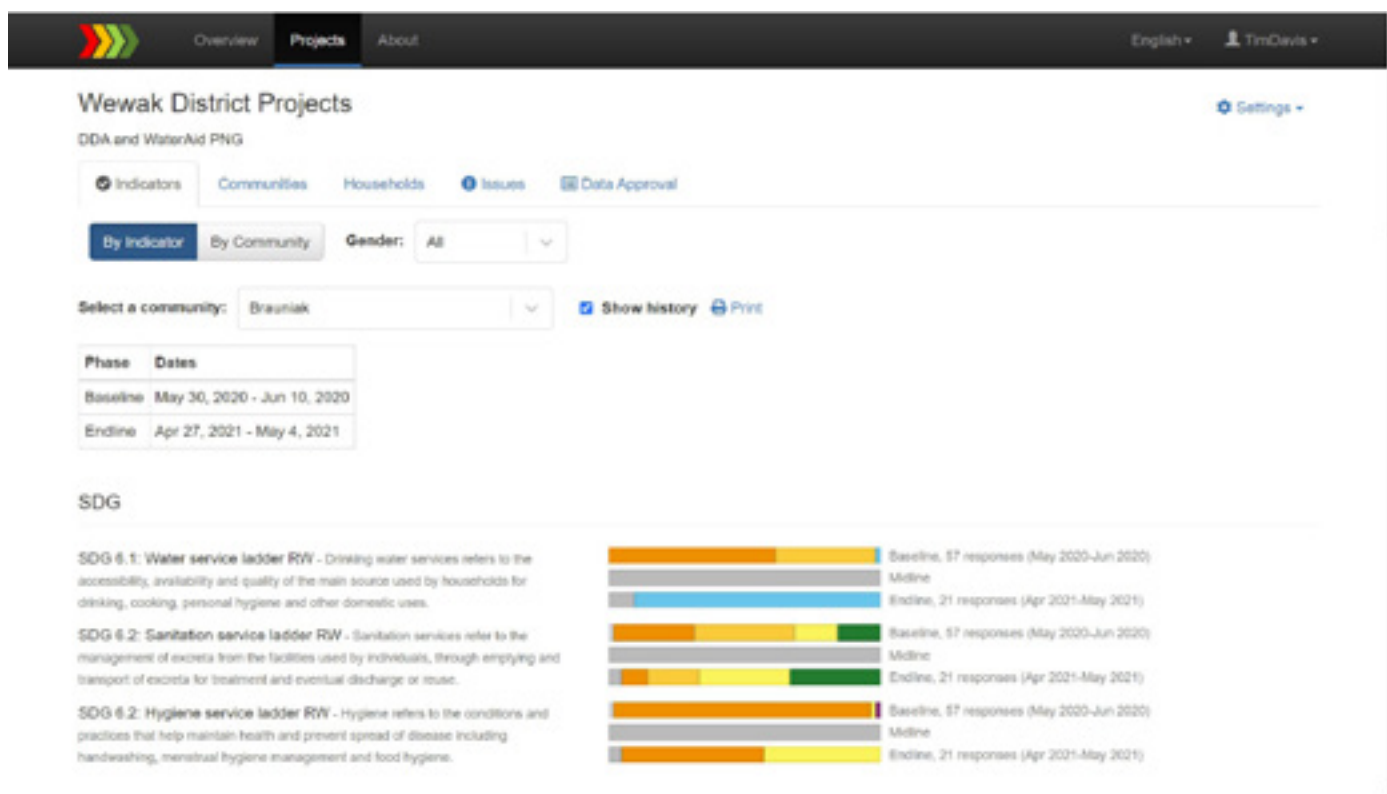


Figure 24. RapidWASH2.0 SDG service levels stacked to display baseline and endline data. Braunek Village, Wewak Islands LLG, Wewak District.

Defining and operationalising safely managed indicators

Analysis of WASH data remains a significant challenge for the monitoring of safely managed services. Prior to the introduction of the SDGs, the benefits of using information and communications technology were well known. Collection of data using consistent forms and via smartphone applications increased efficiency, but the time, effort and deep understanding of JMP indicators needed to apply the calculations and assess data from surveys against the service levels were often beyond the capacities of local government and service providers. WaterAid has worked with mWater since 2013 and integrated SDG question sets into the platform since 2016. These question sets are integrated into RapidWASH 2.0 and can be utilised by anyone choosing to use the system.

While the enumerator sees only a household questionnaire in the surveyor app, in the background the RapidWASH system takes the responses and applies the SDG indicator calculations to determine the household's service levels, which are then displayed at community level in the online dashboard (Figure 24).

The RapidWASH system follows the JMP's methodology for identification of safely managed services; however, as in the JMP, some assumptions must be made in categorising service levels. For example, as per the JMP for safely managed sanitation, if a household has their own improved toilet (not shared with other households), but has never emptied the pit or septic tank, then this would meet the requirements of the 'safely managed' category; the excreta is contained. However, because the whole sanitation chain has not been examined, it is unclear how the household will eventually empty, transport, treat and dispose of the excreta when the pit fills up. Also, similarly to the JMP, each RapidWASH dataset represents one point in time. RapidWASH provides the ability for long-term longitudinal monitoring and observation of changes in service levels over time. So, WaterAid can return several years after the endline to see if a household actually did effectively empty, transport, treat and dispose of their excreta, to determine if the sanitation service level is in fact 'safely managed'.

Measuring safely managed sanitation

In rural contexts, monitoring safely managed sanitation does not have to be complicated. The addition of questions relating to whether the pit or septic tank has been emptied, and if so where the contents were disposed of, provides sufficient information to assess whether the facility is considered safely managed sanitation. In rural PNG, many households do not empty their pit latrines but dig a new pit, fill in the old one and

move their toilet to the new location. The excreta remains in situ, contained and safely managed.

In addition to identifying whether the household has safely managed sanitation, RapidWASH2.0 includes five sanitation service indicators to provide information on the quality and privacy of the infrastructure, household sanitation use and sustaining behaviour (see Figure 25).



Figure 25. RapidWASH2.0 Sanitation Service levels in addition to the SDG service levels.

Safely managed drinking water and monitoring water quality

Monitoring water quality is always a balancing act in low resource settings. Long lists of water quality indicators are sometimes applied stringently, and the resulting exhaustive laboratory testing can prove prohibitive in terms of cost, capacity and logistics. RapidWASH2.0 applies a risk-based approach for selection of parameters for water quality monitoring that can be altered to the risk factors of concern in a given context. Because rainwater is the most common local water source in PNG, biological contaminants pose the greatest threat to health, so WaterAid in Wewak District adopted *Escherichia coli* (*E. coli*) as a priority indicator for water quality testing. JMP chemical contaminants of concern (arsenic and fluoride) [1] are irrelevant for rainwater harvesting, so are not included in RapidWASH's calculation of safely managed water in Wewak.

While RapidWASH offers users their choice of technology for testing and analysis of *E. coli*, WaterAid has globally adopted use of AquaGenx Compartmental Bag Test (CBT) testing kits (Figure 26). The CBT is a rapid field test that detects and quantifies *E. coli* and total coliforms in a 100 mL sample. The CBT utilises a growth medium that, when metabolised, elicits a deep blue-green colour change in the presence of *E. coli* (within 20–48 hrs) [2]. Interpretation of the result is based on colour change of the different compartment volumes. The test provides a reliable 'most probable number' estimate of *E. coli* and the associated risk profile. The technology is lightweight, easy to use, can use ambient air incubation in the tropics, and has been proven to be effective for use by WaterAid and government counterparts.

Water quality testing should always be undertaken in the context of water safety planning. Recognising the resources needed to undertake water quality monitoring at scale, RapidWASH2.0 offers the flexibility to sample at the point of collection or the point of use. In Wewak, WaterAid have been supporting water quality monitoring at the point of collection as a useful tool in the community-based water safety planning process, by motivating the community to identify and alleviate upstream contamination.

Aside from the water quality testing used to determine safely managed water services, RapidWASH contains indicators of householders' perceptions of water quality and satisfaction with the water supply. Data in PNG routinely shows that the communities' main focus is to obtain a large volume of water close to their households, reducing their work burdens. Many households are either unaware of water quality issues or unconcerned given their previous dependence on surface water or other unimproved sources.



Figure 26. Wewak Islands LLG Manager Mr Gideon Kavi takes a water quality sample using the Aquagenx CBT.

Measuring inequality in WASH access

Inequities may be rooted in social, economic, demographic or geographic differences. Social differences are differences due to caste or tribe; demographic differences may be due to age, gender or ethnicity; geographic differences could be between countries, regions, or urban and rural areas. Economic differences are based on wealth.

Wealth quintile integration and data disaggregation

Wealth is an essential component of SDG monitoring. For service delivery, it is important to understand whether services are reaching the poorest, and if the poorest households have access to the same WASH service levels as wealthier households.

Integration of wealth quintiles into monitoring is complex. Every country is different and has specific and varied indicators of wealth. Some countries, like Cambodia, have their own system for identifying poor households; other countries, like Timor-Leste and PNG, do not. Many countries (particularly in Southeast Asia) are undergoing rapid economic growth, which mean indicators of wealth are dynamic; questions around wealth need to consider that someone who stays in the same quintile may not necessarily be as poor as they were in the previous survey round.

To integrate wealth quintiles into the RapidWASH system, WaterAid partnered with Metrics for Management, an organisation specialising in statistics that has developed a tool called Equitytool [3]. Metrics for Management analyses the list of questions in demographics and health surveys, censuses and other nationally statistically representative surveys, to identify the questions most relevant to wealth are identified. WaterAid added these country-specific question sets to each country's household survey and applied the corresponding weightings to the RapidWASH2.0 system. Figure 27 presents baseline survey data from RapidWASH2.0 for Ward 15, Kairiru Island, Wewak Rural LLG, showing that most of the ward's poorest households practise open defecation. While this data has been useful for WaterAid's program decisions, more work is needed to ensure that LLG government officers understand and act on the wealth quintile data, for example, by including poorer households in community engagement and water supply design processes.

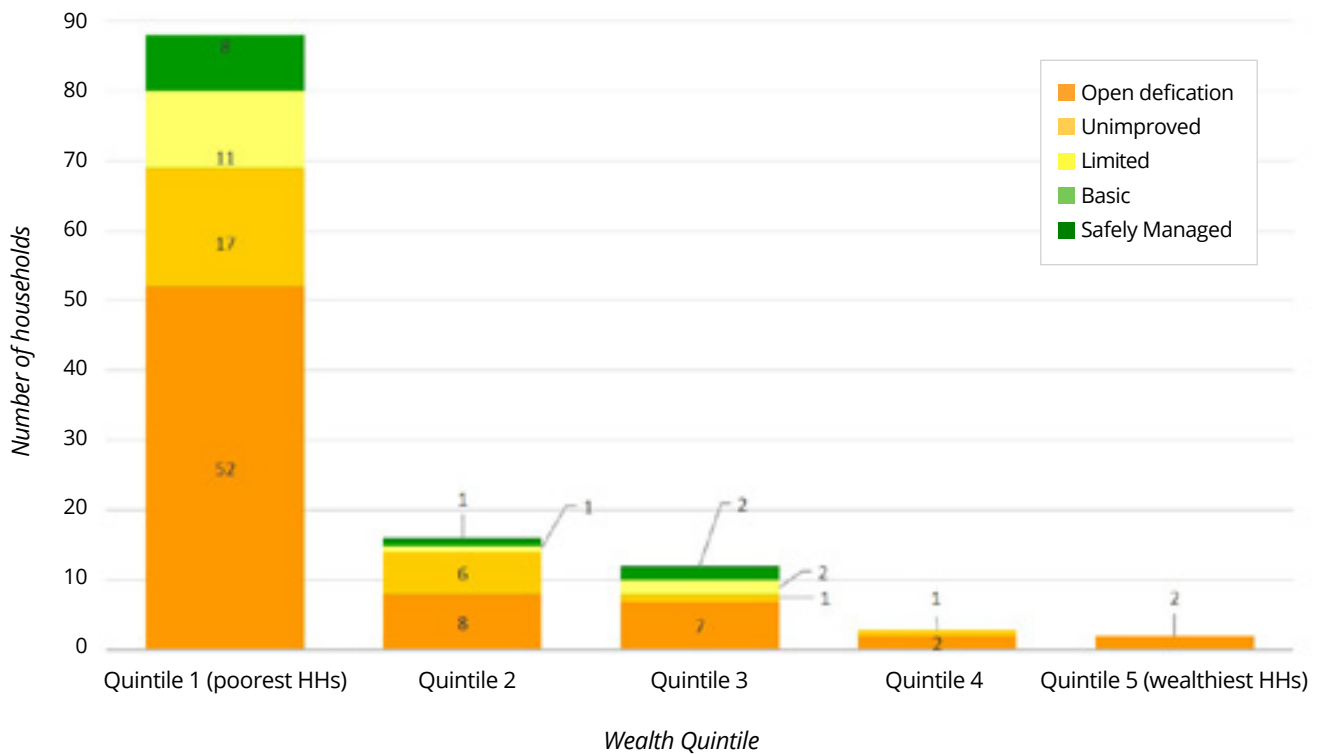


Figure 27. SDG sanitation service levels (baseline) disaggregated by Papua New Guinea wealth quintiles. **Source:** WaterAid

Gender and disability disaggregation

In many contexts it is common practice for household surveys to be undertaken with the head of the household. Often the heads of households in PNG are male, which can result

in the voices of women and gender diverse people being underrepresented in data and decision-making processes. By default, all RapidWASH data is automatically disaggregated by head of household gender. Data can also be displayed by the respondent gender (Figure 28).

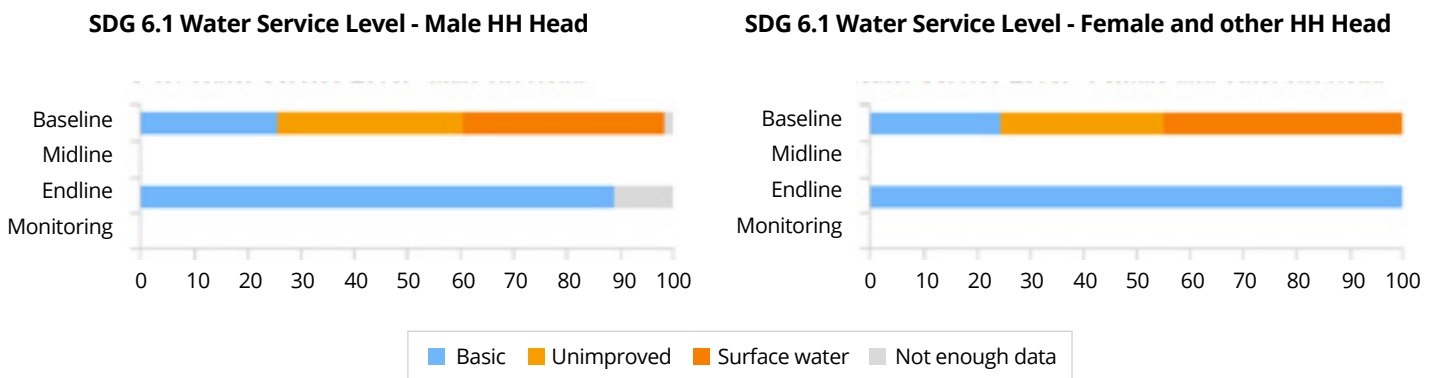


Figure 28. SDG service level disaggregated by head of household gender including male, female and other gender. **Source:** WaterAid

Lessons learned about mainstreaming safely managed water services with government decision-makers

Monitoring safely managed water services introduces many new concepts; if government doesn't understand or see value in the concepts surrounding service levels, they are unlikely to adopt, measure or use data in their practice. When WaterAid began to work with provincial and district governments in Wewak, they had limited WASH data and WASH was not a high priority. Decisions that were made about WASH were not based on data and evidence.

Mainstreaming safely-managed data use must be a practical and participatory journey. Improving local governments' monitoring began with practical training about key WASH terms and concepts, such as different types of toilets and water points, the concept of the JMP service level ladders, and water quality testing. WaterAid worked with the Wewak District WASH Coordination Body and LLG representatives to undertake (using mWater) a district-wide baseline assessment in 208 rural communities, 111 schools and 27 health care centres to inform district WASH planning. Involving local government as enumerators in the data collection built their practical understanding of WASH and deepened their understanding of the WASH situation in their context.

Having a clear purpose for data improves its use. As with all monitoring processes, the data gathered through RapidWASH can be hugely useful for WASH decision-making and service improvement, but it can also be left unused. The results of the district-wide baseline were used to create a costed five-year Wewak District WASH Plan, launched in March 2020, which the district government is using to allocate funding and prioritise water supply projects.

Building an open, reflective culture around data use leads to better data use. In Wewak, data use did not wait until the final analysis and presentation but began during the data collection. Regular reflection sessions with the enumerators and district WASH coordination body prompted discussions about what needed to be done to respond to the issues of low WASH access they were encountering. By contrast, when WaterAid has used RapidWASH 2.0 with implementing partners in Timor-Leste for baseline and endline reporting of service delivery, partners tended to use the data simply to report the number of people gaining access to basic and safely managed services without engaging more deeply with the question 'what does this data mean for ongoing service delivery and improvement?'

Where to next: Sustainability beyond the Water for Women project

Wewak District

Wewak District Development Authority (DDA) was one of the first districts in PNG to develop a five-year WASH plan. The plan sets out the priority WASH projects, the financial resources and the service delivery approach. Wewak DDA and the WASH coordination body adopted RapidWASH for monitoring the community WASH projects in the five-year plan, with government officers undertaking the data collection. Until now, the DDA has relied on WaterAid to present data and findings at the quarterly WASH coordination body meetings; institutionalising RapidWASH for sub-national government will require more support to build confidence, experience and capacity among sub-national data users, as well as advocacy to provincial and national levels for in-house financial and human resources for WASH monitoring.

Beyond WaterAid and Wewak District

RapidWASH 2.0 is freely available for the WASH sector to use. It is a fit-for-purpose tool for civil society organisations implementing WASH service delivery at the community level. It is a very useful tool for reporting and internal accountability. Recently, World Vision PNG used the RapidWASH2.0 tool for its WASH program in South Fly District and used the survey results to inform its community engagement and design strategy.



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Acknowledgements

The RapidWASH service level monitoring system was developed by WaterAid, IRC and mWater in 2016 with support from the Australian Government under the Civil Society WASH fund. WaterAid enhanced the system in 2018 to strengthen SDG functions and data desegregation, this was undertaken with support by the Australian Government's Water for Women Fund.

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For more information on the RapidWASH2.0 system, visit RapidWASH2.mwater.co.



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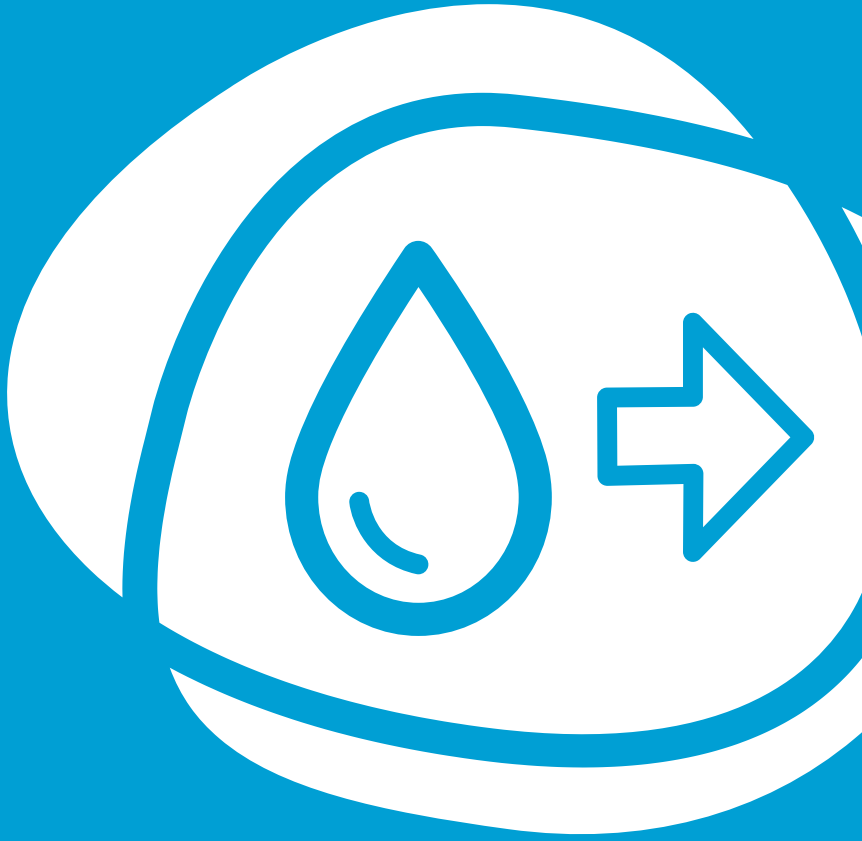
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