Systems interventions for the transition from basic to safely managed water and sanitation services

Paul Hutchings, Stef Smits and Marieke Adank

IRC Supporting water sanitation and hygiene services for life
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE
UNIVERSITY OF LEEDS
UK International Development
Partnership | Progress | Prosperity

About this publication
This report was developed under the WASH Systems for Health Facility, financially supported by the FCDO (Foreign, Commonwealth & Development Office) of the UK government. We also thank the partners under the WASH Systems for Health programme who provided insights through various learning sessions.

About the project
The WASH Systems for Health (2023-2028) project supports governments in sub-Saharan Africa and South Asia to strengthen the systems needed to establish resilient and inclusive WASH services and end the preventable deaths of mothers, young children and infants. It aims to improve health, and education outcomes. Global project partners include the London School of Hygiene and Tropical Medicine (LSHTM), the University of Leeds, and IRC acting as the consortium lead. The project operates in Bangladesh and Nepal (led by WaterAid Bangladesh, including SNV); Malawi and Tanzania (led by SNV, including Water For People); and Nigeria and Sierra Leone (led by Self Help Africa, including Goal). The project is funded by UKAid/FCDO.

Authors: Paul Hutchings (University of Leeds), Stef Smits (IRC) and Marieke Adank (IRC)
Reviewers: Barbara Evans (University of Leeds) and Fiona Gore (World Health Organization)

Copy-editor: Tettje van Daalen (IRC)
Design: Dechan Dalrymple (IRC)

Cite this publication as follows:
Hutchings, P., Smits, S. and Adank, M. (2026). Systems interventions for the transition from basic to safely managed water and sanitation services. The Hague, IRC
doi: **10.17037/PUBS.04682163**

Systems interventions for the transition from basic to safely managed water and sanitation services

Paul Hutchings, Stef Smits and Marieke Adank

Acknowledgements

This report has been written by Paul Hutchings (University of Leeds), Stef Smits and Marieke Adank (IRC). The data analysis of trends in service levels was done by Arjen Naafs of IRC. In the original conceptualisation of the settings and transition pathways, we were supported by Barbara Evans of the University of Leeds.

We especially thank the peer reviewers, Barbara Evans (University of Leeds) and Fiona Gore (World Health Organization), for their valuable feedback.

Abbreviations and acronyms

FCDO	Foreign, Commonwealth & Development Office
GLAAS	Global Analysis and Assessment of Sanitation and Drinking-Water
JMP	Joint Monitoring Programme on Water Supply, Sanitation and Hygiene
NGO	Non-governmental organisation
SBM	Swachh Bharat Mission
SDG	Sustainable Development Goal
WASH	Water, sanitation and hygiene

Contents

List of figures

List of tables

Executive summary

Background

The world remains off-track to meet the global targets for water and sanitation. Achieving basic water and sanitation services is no longer sufficient to protect public health or meet national development ambitions. Countries must instead deliver safely managed services—water that is provided on premises, available when needed and free from contamination, and sanitation that safely contains, transports, treats and disposes of waste. These service levels are essential, but achieving them remains a significant challenge worldwide.

Progress to safely managed services has accelerated in some regions, yet remains uneven and fragile. Many countries lack clear guidance on how to navigate the system transformation required to support safely managed services.

This report addresses that lack of guidance. It identifies thirteen high-level transition pathways that countries typically follow as they progress from basic to safely managed water and sanitation services. It examines the drivers of these transitions and the system implications for households, service providers, and governments. The report is intended to support policy makers, regulators and sector stakeholders to design strategies that accelerate and sustain progress.

Transition pathways

The transition from basic to safely managed services does not follow a single route. Different service delivery models often coexist within the same country, district or even neighbourhood, resulting in multiple pathways operating simultaneously.

The report identifies a set of transition pathways reflecting how systems evolve from basic access to meeting safely managed criteria. These are organised across three types of settings—low-density rural areas, villages and small towns, and urban areas—each with predominant service delivery models.

Service	Type of setting with predominant service delivery model	Safely managed pathway
Water	Low-density rural areas: household-managed supplies	Supported self-supply
		Connection to piped schemes
	Villages and small towns: communal rural supplies	Direct shift from point sources to piped household connections
		Shift via an intermediate step to public standposts, then household connections
		Improving continuity and water quality in existing piped systems
	Peri-urban and urban areas with utility-managed networks	From non-piped sources to household connections
		From kiosks/intermediaries to household connections
		From basic piped supply to safely managed (continuity + quality)

Sanitation	Rural sanitation with current on-site sanitation	On-site containment with safe in situ disposal
		On-site containment with faecal sludge management (FSM)
		Shift to sewer-based systems
	Small town and urban areas with mixes of on-site sanitation and sewers	Urban sanitation: professionalised FSM
		Urban sanitation: progressive sewer expansion

In low-density rural areas, transitions often begin with household-managed water supplies such as wells or boreholes. As population density increases, systems move towards supported self-supply—including risk-based water safety approaches—and ultimately towards household connections to piped schemes. For communal rural systems, the most direct route to safely managed services involves transitioning from public access points to household connections, followed by targeted improvements to ensure continuity and water quality. Whilst, in peri-urban and urban areas, utilities typically follow a two-step ladder: first, densifying household connections (including reducing or restructuring connection fees, regularising informal connections, and extending laterals), and second, upgrading service levels to ensure continuous, safe supply.

Sanitation transitions are more context-dependent, shaped by hydrogeology, population density, affordability, and the capacity of local authorities. Three high-level pathways emerge that vary across contexts: 1) enhancing on-site containment technologies and design to enable safe in situ disposal, although in some contexts the long-term sustainability of in situ systems may be limited; 2) strengthening the sanitation value chain of regulated emptying, transport and treatment for sanitation that combines on-site containment with FSM; 3) a shift to, and improvements within, sewer-based systems, where density and public finance allow. In practice, a mix of pathways involving FSM and sewers is likely the long-term route to safely managed sanitation for many contexts.

Drivers of the transition

Transitions to safely managed services are shaped by the actions and incentives of three main groups of actors: households, service providers, and governments. Each contributes differently to service improvements.

Households

Household demand strongly influences the uptake of household water connections and improved containment for sanitation. However, demand is typically weaker for aspects such as water quality, continuity of supply, or wastewater treatment. Demand-side measures—including outreach, awareness campaigns, financial facilitation and connection drives—can help stimulate uptake, but may be insufficient in areas such as desludging and treatment, where governments often need to take a more direct role.

Service providers

Service providers—including utilities, small-scale operators and FSM businesses—often have incentives to expand household connections and improve service performance, as this increases revenue and enhances operational efficiency. However, they face barriers such as low financial returns in remote areas, limited technical capability, or weak regulatory pressure. Service providers can take steps such as introducing flexible payment modalities for connection fees; strengthening operational performance and professionalising service delivery; and, planning for systematic expansion of service areas.

National and local governments

Governments often need to reinforce these efforts through regulation, financial support and clear mandates. Key levers include:

- **Legislation and regulation:** Obligations to connect to networks, standards for containment and treatment, and performance benchmarks for service providers.
- **Financing:** Targeted subsidies for households, restructuring or waiving of connection fees, and capital investment for network expansion, FSM infrastructure and treatment facilities.
- **Institutional clarity:** Clear delineation of mandates for utilities, municipalities, regulators and FSM operators to avoid fragmentation and improve accountability.

Principles for accelerating progress

The report concludes with three overarching principles to guide governments and utilities in enabling, accelerating and managing transitions to safely managed services.

1. **Provide leadership with a clear vision, targets and strategy:** Progress depends on strong political and institutional leadership. Setting a clear vision—whether defined by safely managed criteria or by service aspirations such as a tap in every home—helps galvanise stakeholders, overcome resistance and legitimise investment strategies.

2. **Use data to diagnose limiting factors and guide transition pathways:** Because safely managed services depend on meeting multiple criteria, decision-makers must understand which criterion currently constrains progress: on-premises access, availability, water quality, containment, emptying, transport or treatment. Improved data collection, disaggregation and analysis are essential to identify relevant pathways and target interventions effectively.

3. **Take an area-wide approach:** Multiple service delivery models may coexist within a single area. An area-wide planning approach enables governments and providers to coordinate interventions across technologies and providers, sequence investments, and ensure that every part of the population is on a feasible pathway towards safely managed services.

The pathways and frameworks presented in this report provide a practical foundation for countries to understand, plan and accelerate their transition towards safely managed water supply and sanitation services. By identifying feasible pathways, prioritising system interventions, and aligning actors behind a shared strategy, governments and service providers can accelerate progress and ensure safer, more reliable and more equitable services for all.

1. Introduction

This learning brief is focused on the transition from basic water supply and sanitation services to safely managed services. It focuses on conceptualising how water supply and sanitation systems typically change during this transition, identifying systems interventions that can accelerate that transition, and discussing the interaction of enabling factors and risks associated with this increase in service levels.

1.1 Background

Countries are at various stages of providing safely managed water and sanitation services, as opposed to – or often alongside - basic services. In some countries, the focus of government is mainly on ensuring the provision of basic services to all, but there may also be needs and ambitions to move segments of the population up the service ladder towards safely managed services. The needs and ambitions for this transition can come from multiple levels:

- citizens demanding and claiming higher levels of service;
- service providers seeking to provide better services, anticipating it may generate more revenue;
- governments setting targets and making investments in higher levels of service as part of their development plans and SDG commitments.

The urgency for the provision of safely managed services is underlined by the 2023 estimate on the global burden of disease caused by inadequate access to water and sanitation services (Wolf et al., 2023). The health impacts of improved access to water and sanitation will only fully materialise when these are safely managed, with an estimated 69 per cent of diarrhoea, 14 per cent of acute respiratory infections, 10 per cent of undernutrition, and 100 per cent of soil-transmitted helminthiasis prevented by the realisation of universal safely managed services (Wolf et al., 2023).

The provision of safely managed water supply and sanitation services poses different requirements on the systems for the delivery of services, compared to basic services. This is in terms of – for example – the infrastructure being operated, the service delivery models employed, the monitoring of services, the regulations and the financing arrangements.

However, a global literature review on system strengthening for water, sanitation and hygiene service delivery, as part of the WASH Systems for Health project (WASH Systems for Health, 2025) (D'Mello-Guyett et al., 2025; Chiwanda et al., forthcoming), identified a knowledge gap related to systems implications to facilitate this transition from the provision of basic to safely managed services. There is no comprehensive overview or analysis of what these implications are, or what the systems requirements are for providing one or other level of service.

1.2 Objectives and research questions

This paper seeks to contribute to the discussions on the transition towards safely managed services from a systems perspective. Specifically, the objective is to provide insight into and inspiration for: 1) the drivers for the transition, and 2) the systems interventions that can be taken to enable, accelerate and effectively manage the transition.

It seeks to address the following questions:

- What are the drivers for the transition from the provision of basic to safely managed water and sanitation services?
- What are the system implications of the transition from basic to safely managed services, i.e. how do parts of the system need to change and adjust to facilitate that transition?
- What are the types of interventions that different groups of actors in the system can follow to enable, accelerate and effectively manage the transition?

1.3 Target audience

The paper is targeted at staff and advisors in charge of strategy and planning in national government entities (e.g. ministries, regulators), utilities, NGOs and development partners. The paper seeks to provide them with strategic considerations around the transition from basic to safely managed services. The paper is considered also to be of interest for researchers, academics and consultants in the field of systems approaches to water and sanitation services.

1.4 Methodology

This paper has been developed as part of the WASH Systems for Health programme. WASH Systems for Health supports governments in six countries in sub-Saharan Africa and South Asia to strengthen the systems needed to establish reliable, resilient and inclusive WASH services over five years. Alongside implementation of the programme, a strategic monitoring, research and learning component – called the WASH Systems for Health Facility – has been established to ensure lessons learnt are captured to fill global knowledge gaps.

The WASH Systems for Health Facility developed its research and learning agenda, on the basis of the afore-mentioned literature reviews (D'Mello-Guyett et al., 2025; Sylvester et al., 2026) including the transition from basic to safely managed services as one of the four key learning themes for the programme as a whole (Hutchings et al., 2024).

This paper was developed on the basis of these global literature reviews, complemented by insights from programme implementation. In addition, in order to deepen the analysis, the ideas and transition models presented below were refined through participatory conference workshops at the UNC Water and Health Conference, 2024, and within a Learning Forum event in Nepal in February 2025 with delegates from Nepal, Bangladesh, Malawi, Tanzania, Nigeria and Sierra Leone. Moreover, it was complemented by a database analysis of the WHO/UNICEF Joint Monitoring Programme on Water Supply, Sanitation and Hygiene (JMP) data to gain more quantitative insight into the extent to which the transition is taking place.

1.5 Structure of the paper

The paper continues in Chapter 2 by providing the conceptual framework. Chapter 3 details the current status of the transition from basic to safely managed services, including statistics about the trend in that transition. Chapters 4 and 5 present a synthesis of how the transition happens in practice, based on empirical studies, for water supply and sanitation, respectively. This is done for different types of settings, and the key driving actors and systemic interventions that typically drive that transition, are discussed. The last chapter contains the conclusions and recommendations.

2. Conceptual framework

2.1 Definitions of basic and safely managed services

The terms basic and safely managed services have been defined in the context of the global monitoring framework for Sustainable Development Goal (SDG) 6.1 and SDG 6.2, as elaborated in methodological detail by the JMP (WHO/UNICEF, 2018). These terms are defined for the purpose of monitoring, and have been designed with consideration to ensure public health protection through water supply and sanitation services, as well as the feasibility of standardised monitoring required for a global monitoring framework. Although they are thus not normative definitions, they provide a common set of criteria for what a 'good' service represents for water supply and sanitation. The characteristics of each is given in Table 1 below.

Table 1: Basic and safely managed water supply and sanitation service levels

Sector	Service level	Definition	Criteria
Water Supply	Safely managed	Drinking water from an improved water source that is accessible on premises, available when needed and free from faecal and priority chemical contamination	• Improved facility accessible on premises, • Available when needed, and • Free from priority chemical and microbial contamination
	Basic	Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing	• Access to an improved facility • Collection time less than 30 mins
Sanitation	Safely managed	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated offsite	• Treated and disposed of in situ • Stored temporarily and then emptied and treated off-site, or • Transported through a sewer with wastewater and then treated off-site
	Basic	Use of improved facilities which are not shared with other households	• Improved facility • Not shared with other households

The JMP definitions have two limitations:

- Other aspects of what constitutes a good service beyond the criteria listed above are not taken into account. For example, the term 'available when needed' can be considered ambiguous, whereas other aspects such as continuity (number of hours of supply over a certain period) or reliability (with which the supply is provided) may be more specific.
- Certain criteria cannot be assessed upfront. For example, a pit that has never been emptied, but that is expected to contain the faecal matter in situ, is classified as 'safely managed'.

In spite of these limitations, this working paper will use these definitions and consider the distinct and specific implications of meeting the criteria change between basic and safely managed. This means considering specific system changes and interventions related to items such as active water quality management and the management of excreta, wastewater, effluent and faecal sludge along the sanitation value chain, including treatment and disposal. Such changes require distinct infrastructural systems, operations and maintenance processes, as well as financing, planning, monitoring and wider systemic arrangements, compared to what is needed to support basic services. Whilst we do focus on the specific criteria as per the service level definitions of the JMP, we consider that these considerations equally apply to 'higher levels' of service in general, i.e. to other aspects of service delivery that are not captured literally in the JMP definitions.

2.2 The water supply and sanitation system

Water supply and sanitation systems are complex adaptive systems of interacting actors, factors and structural conditions. To conceptualise these systems, this paper uses the building blocks approach that defines the water supply and sanitation systems at the broadest level as: "the social, technical, institutional, environmental and financial factors, actors and inter-relationships that influence water, sanitation and hygiene service delivery in a given context" (Huston & Moriarty, 2018).

The main groups of actors that directly or indirectly influence the system are: citizens (who use and pay for water and sanitation services); service providers (responsible for the day-to-day operation and management of a service, for example, a water utility); service authorities (responsible for services within a defined area, for example, a branch of local government); and national authorities (responsible for aspects such as legislation, policy and regulation). The 'factors' are aspects and dynamics of a system that influence its delivery or sustainability. A building block is the recognisable sub-system within the larger system that influences sector-level outcomes, including both actors, factors, and their interactions, organised around a specific functional domain, such as finance or monitoring.

Whilst the building block framework is useful, it is only one of numerous frameworks in use that define the ideal state of a WASH system, often using a similar 'modular' model. For example, the influential WaterAid systems framework particularly emphasises the importance of function over form in WASH systems (Water Aid, 2024). Other examples, including the conceptual framework underpinning the UN-Water Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) reporting led by WHO and UNICEF, the World Bank Politics, Institutions and Regulation framework, and the UNICEF system strengthening framework.

These frameworks are semi-normative in nature – meaning they provide an indication of what a functioning WASH system looks like - they do not indicate how each building block would or should differ according to the intended level of service being provided. There have been some efforts to address this. In early work, Lockwood and Smits (2011) bring some element of differentiation into the building blocks. They indicate that certain parts of the building block can be expected to be in place depending on the maturity of the sector. For example, the regulatory building block may differ in scope depending on whether large parts of the population are served through very basic communal supplies, or whether most of the population is served through formalised professional providers.

Reflecting these types of differentiation, there is value in a policy and sector development process that considers what the typical changes in the basic to safely managed transition are and how we may shape them to accelerate the transition.

2.3 System change, and its drivers

In recent years, several frameworks have been proposed to accelerate progress towards universal access to water and sanitation, most notably the UN-Water SDG 6 Global Acceleration Framework (UN, 2020) and the UNICEF Game Plan for Safely Managed Sanitation (UNICEF, 2022). The UN-Water framework focuses on four action pillars – engage, align, accelerate and account – and five 'accelerators': financing, data and information, capacity development, innovation, and governance. It positions water and sanitation as foundational to sustainable development, recognising the urgent need for systemic transformation and country-led action to overcome stagnation in SDG 6 progress (UN-Water, 2020).

The UNICEF Game Plan takes a sanitation-specific lens and outlines five shifts needed to achieve safely managed sanitation: raising ambition; strengthening systems; increasing public financing; shifting the market; and triggering demand. It emphasises political leadership and accountability, working through existing government systems, and prioritising inclusive service delivery in rural areas and informal settlements (UNICEF, 2022).

Building on these frameworks, this paper distinguishes between WASH system strengthening and WASH system change. System strengthening refers to deliberate efforts to improve the performance of the WASH system – typically within individual building blocks – in ways aligned with national goals and service levels. By contrast, system change encompasses fundamen-

tally altering the way the entire system is set-up and usually implying changes across multiple building blocks. This system change may be driven by actors from within the system (e.g. a government fundamentally reforming the water supply or sanitation sector) or by broader, sometimes unpredictable external forces such as climate change, technological development, or economic transition. In order to shift from basic to safely managed services, sometimes relatively minor interventions may be needed within the system; but often deeper reforms are needed to change the system.

While these drivers interact in complex and uncertain ways, we highlight three key actor groups with the potential to catalyse the transition to safely managed services:

- Citizens, as service users, influence transitions through their behaviours, expectations, and collective action. Shifts in demand, willingness-to-pay (or not), or political mobilisation around rights to sanitation and water can exert powerful pressure on service systems.
- Service providers – including utilities, community-based organisations, small enterprises, and private sector operators – are central to the development and delivery of new service models, technologies, and operational innovations.
- Governments, from local to national levels, shape system change through regulation, financing, strategy-setting, and leadership. Their role in coordinating actors and enabling investment is especially critical for safely managed service transitions.

While building blocks such as institutions, finance, and regulation are crucial to these dynamics, their exact role in enabling or limiting transitions is not yet well documented. This paper conceptualises and uses empirical cases to explore how these factors play out in different settings to enable a shift from basic to safely managed services.

2.4 Typology of settings for water and sanitation service delivery

In the water supply and sanitation sector, it is common to differentiate approaches and strategies by settings (urban and rural areas, type of settlement pattern) as these settings are associated with specific service delivery models.

As Lockwood and Smits (2011) elaborate, this goes from household-managed supplies in sparsely populated rural areas via community-managed supplies in rural villages to professionalised service providers (public and private utilities, local governments) in small towns and urban areas. The boundaries between these settings and the corresponding models are often blurred. One may find households with their own supplies in urban areas, or utilities providing services in rural villages (Adank et al., 2021). Often different service delivery models co-exist in the same geographic area.

For this study, we propose the following typology of settings and the commonly found water service delivery models in these settings (see Table 2) to identify how the transition happens there – recognising that in reality these transitions may also apply to other settings.

Table 2: Settings and common water service delivery models

Setting	Common water service delivery model
Sparsely populated (low-density) rural areas	Household-managed supplies (also referred to as self-supply)
Nucleated rural villages, growth centres and small towns	Community management of both communal point sources and piped supplies
Urban areas	Connections to water distribution networks in (peri)-urban areas managed by utilities and/or co-managed in a patchwork of other service delivery models

For sanitation, we can describe a similar set of settings (see Table 3), while recognising that the dominant models of service provision differ significantly—particularly between sanitation systems with on-site containment and sewer-based systems. In practice, these systems frequently co-exist within the same geographic area, and integrated planning and service delivery is essential. The concept of Citywide Inclusive Sanitation (CWIS) highlights the importance of managing both on-site and sewer-based sanitation services in a coordinated, equitable, and sustainable manner (Gambrill et al., 2020). Therefore, for the purpose of examining transitions towards safely managed sanitation, we distinguish between the transition to safely managed sanitation in rural areas and urban areas, but recognising that there will be different mixes of on-site sanitation systems and sewer-based systems across different contexts. Each setting, for both water supply and sanitation, is further contextualised and explained within the corresponding water supply (Chapter 4) and sanitation (Chapter 5) chapters.

Table 3: Settings and predominant sanitation service delivery models

Setting	Predominant service delivery models for safely managed sanitation services
Rural areas	On-site containment with either in situ treatment and disposal; or temporary storage in situ, but eventual treatment and disposal off-site
Small town and urban	On-site containment, with faecal sludge stored temporarily and then emptied and treated off-site
	Sewer-based systems with wastewater transported through a sewer with wastewater and then treated off-site

3. Trends in the transition from basic to safely managed water and sanitation

This section presents the status and the trends in the transition from basic to safely managed water and sanitation services. It uses the data from the JMP for the period 2000-2022 (WHO/UNICEF, 2023)[1] on both the current levels of access to these services and the annual rate of change, i.e. the annual increase (or decrease) in the percentage-point of population with safely managed water supply services.

The latter data should be interpreted with caution as these data are not available for all countries[2], and where they are, the time series are not as long as for other service levels. This chapter is therefore mostly exploratory in nature, seeking to identify the broad trends. The details behind those can only be analysed for specific countries that have sufficient data.

3.1 Water supply

The JMP estimates that over this 22-year period, almost 2 billion people gained access to safely managed water supply services, thereby increasing the percentage of the population enjoying such services from 61 to 72 per cent. During the same period, the percentage of the population receiving basic services remained more or less stable at about 20 per cent. More importantly, the population with less than basic access decreased over this period both in absolute (minus 130 million people) and relative (by about 10 percentage points) terms. This implies that some of those moved to basic services, but a larger proportion moved to safely managed services. Some may have moved to basic services, whilst those who had initially enjoyed basic services moved to safely managed services.

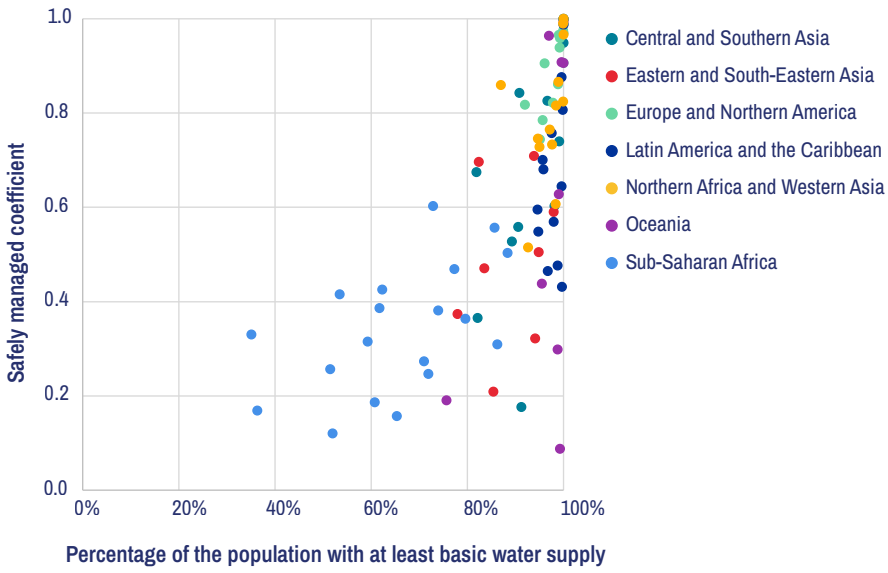
The rate of change was highest in countries in the Central and Southern Asia region[3], with an average of more than 0.78 percentage-point annual rate of change, followed by Sub-Saharan Africa with a 0.48-percentage-point annual increase.

For a transition from basic to safely managed services to take place, one does not only need to look at the rate of change, but also at the proportion of those who have at least basic services that have safely managed services. Therefore we propose a 'safely managed coefficient', which is calculated as:

Safely managed coefficient = ((per cent at least basic) - per cent basic) / (per cent at least basic)

Figure 1 shows that as overall access to at least basic services increases the safely managed coefficient increases. This seems intuitive: as overall access rises, a higher proportion of people will move towards better services. But not all countries follow the same linear pathway. Some countries have achieved near universal access but with a small safely managed coefficient, so largely through basic services. Countries that have achieved very high proportions of safely managed services (more than 60 percent) all have access to at least basic services of more than 80 per cent.

1 We acknowledge that JMP published the data up to 2024 in the course of 2025. As this part of the analysis was already concluded we could not update it with the new data. Whereas the specifics for certain countries may have changed in these last two additional years, we expect the broad trends to have remained the same.
2 It should be noted that no data exist for the two most populous countries in the world, China and India.
3 This paper uses the SDG region definitions.



(Source: WHO/UNICEF, 2023)

Figure 1: Safely managed coefficient for water supply as function of the percentage of population with at least basic water supply in 2022

In addition to looking at the status of the safely managed water supply coefficient, one can look at the change of the coefficient as access to at least basic services changes, as shown in Figure 2 below.

- The countries in the green ellipse are ones of which the JMP collated data suggest they are experiencing a rapid transition: there is a rapid increase in access to safely managed water supply services, and where that increase is higher than the increase in basic services. According to the JMP data, the countries that are on this trajectory include Bhutan, Moldova, Morocco, Ghana and Jordan, as well as several of the Central Asian countries.
- Countries outlined in yellow are ones where an increase in access to safely managed services is high, but where there is a relatively higher increase in access to basic services. There is thus no net transition from basic to safely managed services. JMP data suggest that this is the case in Azerbaijan, Afghanistan and Senegal.
- Countries in red see an absolute and relative decrease in safely managed services. Nepal falls in this category according to JMP data.

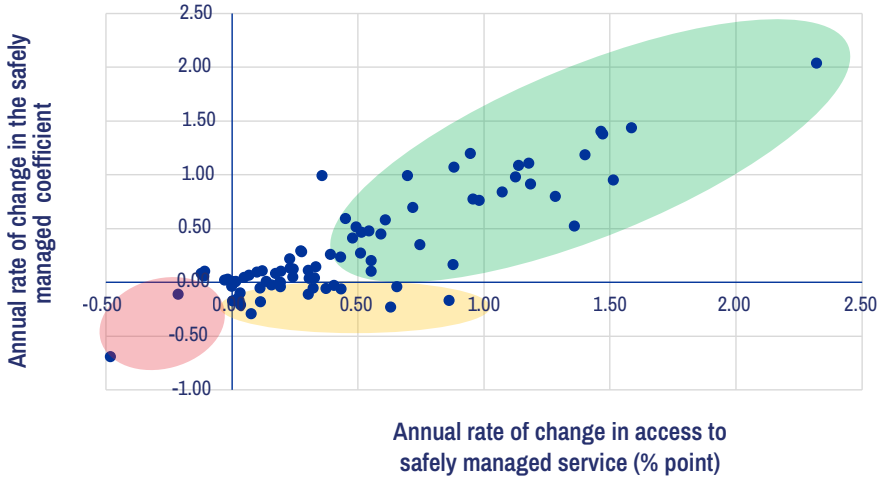


Figure 2: Annual change in the safely managed coefficient in countries as a function of the annual rate of change in access to safely managed drinking water

services

In order to understand what drives these changes, one needs to look at the underlying criteria (accessible on premises, available when needed and free of contamination) which determine whether a drinking water service is considered as safely managed in the JMP data. In 2022, in 50 of the 90 countries which reported data, 'free of priority contamination' was the most common limiting criterion. That is, it was the criterion that was achieved for the lowest proportion of the population, compared to the other two criteria.

Some regional differences also emerge. In Sub-Saharan Africa, having access to water on premises was the most common limiting factor in a majority of countries. This reflects the fact that in many parts of Africa, both in rural and urban areas, providing water through point sources and public standpipes has been predominant. In Europe, Northen America and Europe availability of supply is the most frequent limiting factor (See Figure 3).

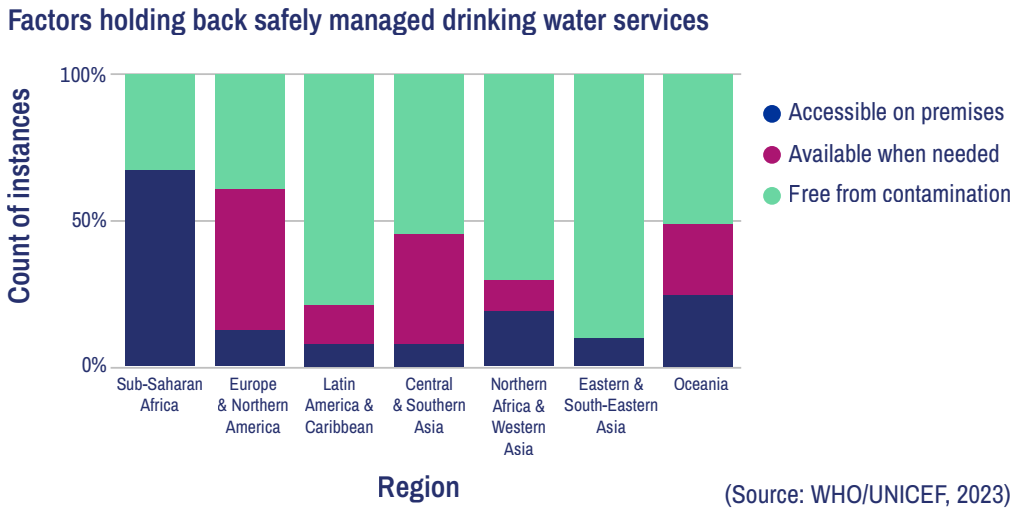


Figure 3: The number of countries with most limiting criteria in each of the SDG regions in 2022

The relative importance of these criteria has been changing over time. In the year 2000, having water accessible on premises was the most common limiting criterion in a larger number of countries, and across various SDG regions. Comparing rural and urban areas, it is notable that accessibility is a more limiting criterion in rural areas, whereas in urban areas availability and free of contamination are more common limiting factors. But both in rural and urban areas, accessibility is less of a limiting criterion compared to previous years. In other words, over the past decades, there has been a relatively strong increase in having water on premises, both in urban and rural areas. But in rural areas, the transition from point sources to water on premises is not as far advanced as in urban settings. As accessibility is being addressed, availability and having water free from contamination become the most limiting criteria.

The countries that have made the strongest transition from basic to safely managed water supply services over the period 2000-2022 (as identified above) have reported the most rapid changes in the following underlying factors:

- **Bhutan:** rapid increase in water that is free from contamination, whilst also gradually increasing accessibility and availability.
- **Jordan:** increase in the percentage of population that has access to water that is available when needed, as accessibility and free from contamination were already high.
- **Ghana:** concurrently improving accessibility and availability from a low level, whilst also having some improvement in free from contamination.

- **Moldova and Morocco:** both saw a particularly sharp increase in accessibility, whilst also gradually improving availability and free from contamination

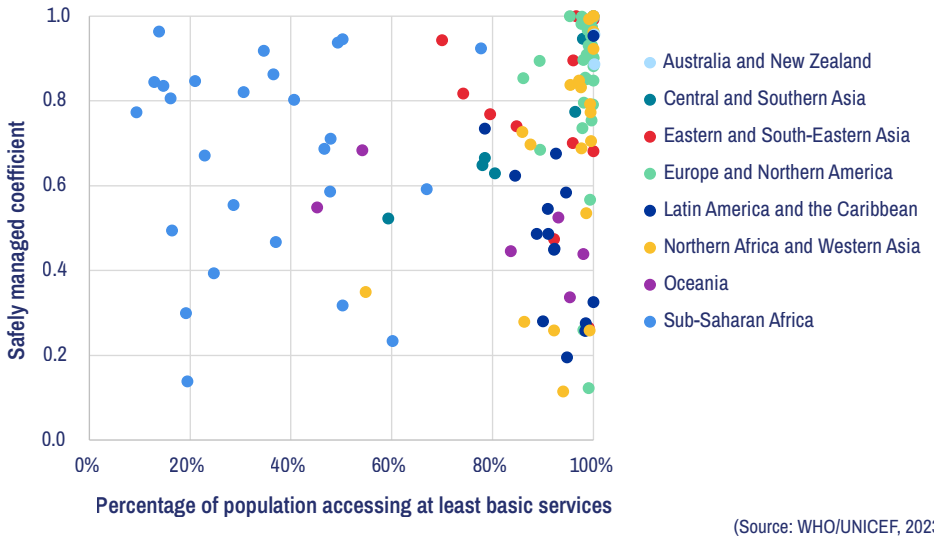
These data indicate that there are multiple pathways to transition from basic to safely managed water supply services. These countries have reported significant progress on those criteria that were most limiting, whilst also improving on the other ones.

3.2 Sanitation

The JMP estimates that over the period of 2000-2022, 2.6 billion people gained access to safely managed sanitation services, thereby increasing the percentage of the population enjoying such services from 31 to 57 per cent. During the same period, the population receiving basic sanitation services remained more or less stable at around 24 per cent, though that still meant that some 371 million people gained access to these services. The number of persons with less than basic access, or practising open defecation, decreased over this period by some 844 million people. It is likely that an important part of this population first got basic sanitation as others moved on to safely managed services.

The rate of change was highest in countries across Asia (both in the Central and Southern Asia and East and Southeastern Asia region), with an average of more than an 0.75 percentage-point increase per year. In other SDG regions, the annual increase in access to safely managed sanitation was more limited (on average around 0.4-percentage-point per year)

Figure 4 shows that the relation between the safely managed coefficient and the population accessing safely managed services is different for sanitation than for water.



(Source: WHO/UNICEF, 2023)

Figure 4: Safely managed coefficient for sanitation as a function of the percentage of the population accessing at least basic sanitation services

Many countries report having achieved universal access to at least basic sanitation services, but some have done so almost exclusively through basic services, others with safely managed services, and others through a mix.

The figure shows that there are many countries, particularly in Africa, which have a high safely managed coefficient, but a relatively low proportion of their population access at least basic services. In other words, in those countries relatively few people have at least basic services, but those who do, have safely managed services. The explanation behind this is that they have done so through the first of the three technological options for safely managed sanitation described in Section 5.1, i.e. faecal waste is contained and disposed of in situ through various types of containment such as pits and tanks. It is thus possible for a country to record a high percentage of safely managed sanitation services through the relatively simple and cheap first tech-

nology options. However, these data need to be interpreted with caution as they are in part based on assumptions, and may well represent over-estimations. There are indeed certain facility types, such as twin pit latrines, which are explicitly designed to deliver safe in situ containment and disposal. However, the safe containment and in situ disposal of other types of pits and tanks depend on environmental and hydrogeological conditions, and on user emptying behaviour which vary widely and are often poorly understood. In the process of getting estimates for global monitoring, assumptions are made about the percentages of such technologies that provide safe disposal in situ. These assumptions may not hold true, and could well represent an overestimation, especially for more recently built facilities that have not yet reached the stage of emptying.

The second and third technology options described in Section 5.1 (i.e. in situ containment, followed by emptying and subsequent treatment and disposal; or sewers with treatment and disposal) involve longer more complex service chains with multiple failure points. If any one step is unsafe—such as leaking containment systems, unsafe emptying practices, or non-functional treatment infrastructure—the system should not be considered safely managed. It also implies that a much larger system needs to be in place to include all these steps in the sanitation chain. This creates two important data issues: (1) contexts where most of the chain functions effectively, but for one step, are treated the same as contexts where most of the chain is absent; and (2) household surveys can capture facility and containment type, but data on emptying services, transport and treatment must come from larger-scale system-level sources, making it inherently difficult to verify the entire sanitation value. Mills et al. (2024) further highlight additional limitations to safely managed sanitation data, including unassessed exposure routes such as animal access, groundwater contamination risk and overdue emptying, which are not captured in global monitoring but significantly alter safety assessments. As a result, their study finds that, globally, systems classified as safely managed fall from 56 to 16 per cent when complementary indicators are included, suggesting substantial overestimation in current monitoring approaches.

This means that there is an inherent difficulty in assessing and comparing the shift from basic to safely managed sanitation between countries. It does help, however, to analyse changes in the mix of technologies for the various components of the sanitation value chain, as well as their management (emptying or not), as first approximation of reasons for slower and faster transitions. Looking at the five countries that reported the most rapid increase in safely managed services (Andorra, China, India, Mexico and Peru), as per the data contained in the JMP database, they report having had different mixes of technology and ways of improving those:

- Andorra, China, Mexico and Peru largely have seen significant increases in sewer-based sanitation
- In China, in addition, there has been a reduction in latrines but increase in septic tanks, with a cumulative improvement of those being classified as safe disposal in situ.
- In India, sewerage and wastewater treatment are relatively low, but there has been a marked reported increase in safe disposal in situ.

Because countries employ a different mix of technologies, with different potential to move towards safely managed, further breakdowns by regions or types of countries have not yielded additional insight. Rather, we focus on specific trajectories at country level in later sections to unpack these dynamics and identify feasible transition pathways depending on the mix of technology.

4. The transition in practice: water supply

This chapter describes and analyses empirical cases of the transition from basic to safely managed water services. It does so for each of the three types of settings identified before. For each setting, we describe the generic pathways through which a service can meet the criteria for safely managed. It then defines the systemic drivers and interventions for the transition.

4.1 Household-managed supplies in low-density rural areas

Characterisation of the transition pathways

Household-managed supplies are a common service delivery model in sparsely populated (low-density) rural areas. Under this model, households initiate and fund the development, and incremental improvements, and management of their own water supplies. It is also referred to as self-supply (Sutton and Butterworth, 2021), though sometimes financed and installed by external agents. These household supplies would usually be either unimproved (unprotected springs and wells), or basic water supply systems, such as rainwater harvesting tanks and protected springs and wells. This infrastructure is almost always on premises. Such systems are often not considered as safely managed because water quality is not systematically monitored and controlled. Moreover, some of these supplies may be intermittent and hence not 'available when needed'.

This is a setting, and service delivery model, that usually receives little attention from public authorities, as addressing water quality and intermittence of such supplies is seen as a 'last mile' challenge. It is for that reason that most of the examples reported here are from upper-middle and high-income settings, where there is often more emphasis on addressing water quality and availability of these household supplies.

There are two potential pathways for the transition to safely managed services in such a setting, as shown in Figure 5.

- Pathway 1 involves a shift to a supported self-supply model, defined as the process by which households are enabled to incrementally improve their level of services, still largely by their own means, but supported by others (Sutton and Butterworth, 2021).
- Pathways 2 is one whereby households are gradually encouraged or even obliged to connect to a piped supply. This happens in situations in which the rural areas gradually densify as well as infrastructure in the area, and whereby both government and service providers have an interest to connect as many households as possible.

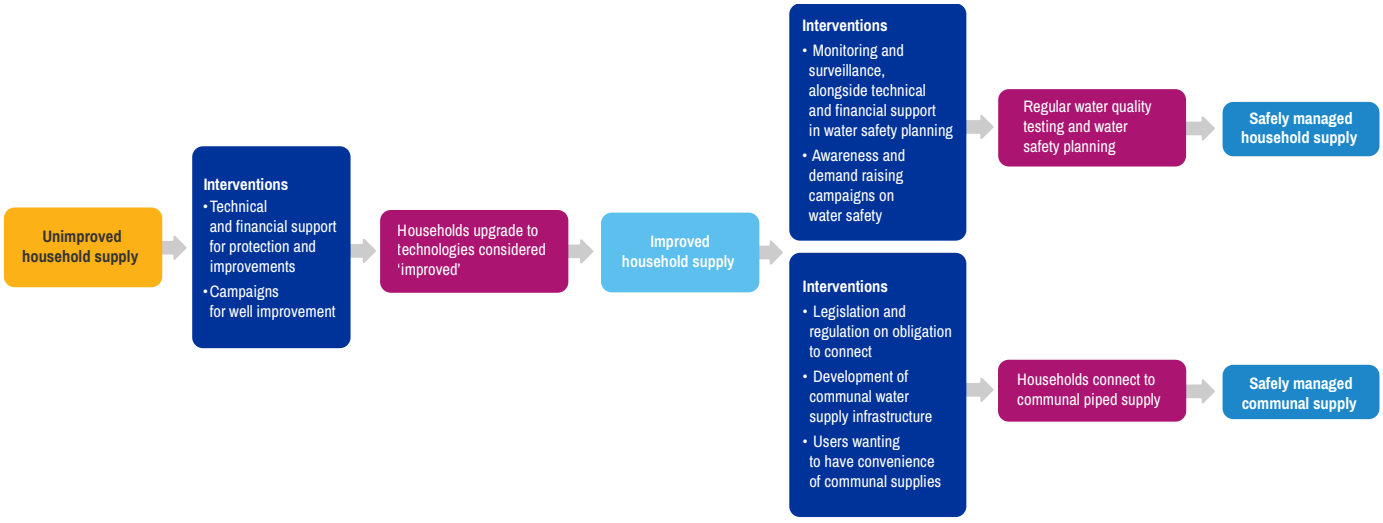


Figure 5: Transition pathways for household-managed water supplies in low-density rural areas

Below we elaborate the systemic drivers and interventions for both pathways.

Systemic drivers and interventions

Key driving actors in this type of setting are **households** themselves. For both pathways, users eventually decide whether they gradually improve their own supplies and have the quality of the water from these supplies tested, or to connect to a communal piped supply. In these situations, they may be driven by considerations of convenience, health concerns, financial costs of different options, amongst others. They may be triggered, encouraged or even required by the relevant authorities.

Pathway 1: 'supported self-supply'

Because these household supplies are individually owned and managed, there are no authorised service providers. Yet recognising the potential public health risks of such supplies, makes **health and environmental authorities** important actors in driving particularly the first transition pathway. They can undertake the following systemic interventions:

- **Establishing supported self-supply programmes** that enable households to apply technologies that are considered 'improved', such as protected wells and springs (as opposed to unprotected ones) and rainwater harvesting. Examples of such programmes include the National Jar Programme in Thailand (Saladin, 2021), the One Million Cisterns Rainwater Harvesting Programme in Brazil (Cardoso Castro, 2024), and the National Upgraded Well Programme in Zimbabwe (Morgan, 2021). These are all large-scale programmes which either provided wholesale implementation of improved technologies or the creation of production chains in combinations with targeted subsidies. In other cases, programmes focus on smaller incremental improvements. For example, in Scotland households that own private wells can receive small grants for improvements (Bower, 2021).
- **Creating awareness about water quality risks and their management.** Authorities can generally promote such awareness, with the expectation that households take measures to improve their household supplies or actively manage water quality risks. This is particularly the case where such household supplies are not, or cannot be, regulated. WHO (2024) presents a case study from Ireland where the Environmental Protection Agency provides guidance on and support to unregulated household-managed supplies, through a video and an app for well owners. This is also linked to a small grant scheme for well improvement.
- **Requiring or facilitating water quality testing of household supplies.** This intervention implies that a service authority takes area-wide responsibility for regular water quality testing of such supplies, either at the cost of the household or of the authority. It may also place the responsibility on the household, by either requiring regular testing or enforcing that. For example, in New Zealand a house cannot be sold without certification that its supply is wholesome, reliable, and compliant with local authority standards. However, given the large numbers of geographically dispersed supplies, this is relatively expensive and logistically challenging. Based on a survey across most European countries, Rickert et al. (2011) conclude that surveillance and water quality testing of small-scale supplies (including household supplies) is frequently inadequate or inexistent. Also, for owners there is usually no regulatory obligation or incentive to do so. To overcome these limitations, water quality testing requirements for private wells may be lowered, e.g. in terms of the frequency of tests to be taken, or the number of parameters to be tested (Rickert et al., 2016). WHO (2024) provides guidance on the parameters and frequency for water quality testing for household-managed supplies. Some countries, such as Austria, offer mobile water quality testing facilities for a modest fee (Smets, 2021).
- **Promoting risk-based approaches, such as sanitary inspections and water safety planning,** as an alternative or complement to the limitations of regular water quality testing of household supplies. WHO (2024) in its drinking water quality guidelines for small-scale supplies promotes the adoption of risk-based approaches, focusing on the monitoring of a limited number of water quality parameters. This is then to be complemented by sanitary inspections by households, so they can take local remedial actions.

The above-mentioned interventions already imply that health and environmental authorities are actively focusing their effort on household supplies. In many countries only a small percentage of the population depends on household supplies, or that percentage may be invisible or unknown. As a result, this segment falls outside the mandate or priority of health and environ-

mental authorities. In such cases, first interventions may need to be undertaken by **other authorities** – e.g. the ones in charge of water supply more broadly -, or **NGOs or research institutions**, to provide data about the scale and relative importance of this segment of the population. Rickert et al. (2016) and WHO (2024) identify a number of what they call policy actions and actions in the enabling environment. These include: establishing a baseline and undertaking data analysis around household supplies; setting targets for improvement; developing legislation and regulation that provide the necessary mandates to health and environmental authorities, including regulatory powers that are sufficiently differentiated for household-managed supplies; and setting surveillance and monitoring standards. Smets (2021) recommends piloting supported self-supply mechanisms as a way of convincing governments that this is a viable approach to achieve SDG targets. Alvarez et al. (2019) report on pilot programmes led by NGOs and other technical support agencies to improve household water supplies in four Latin American countries, with the aim of developing these into broader supported self-supply programmes, for eventual adoption by government. Both these reports highlight that such pilots go beyond the technological option, but include a wider programmatic approach to supporting self-supply.

Pathway 2: 'connecting to piped supplies'

In places where the transition from basic to safely managed follows the pathway of connecting households to a piped supply, **service authorities** and **service providers** play a key role in facilitating, encouraging and in some cases requiring households to connect. They may be driven by several considerations, including: 1) increasing the number of paying users and hence the ability to generate revenue, 2) providing a service that is considered more convenient and more modern than household self-supply, 3) the wish to have a smaller number of regulated service providers, as opposed to a larger number of unregulated household-managed supplies.

They can undertake different systemic interventions, including:

- **Developing piped supply programmes and encouraging owners of household supplies to connect.** This is a standard approach in many rural water supply programmes, whereby all or most households in a certain area are encouraged to connect to newly constructed piped supplies, irrespective of their previous service conditions (unserved or served through basic household supplies). In most middle- and high-income settings, this approach to shift to another service delivery model is working. Sutton and Butterworth (2021) illustrate this with an example of the rapid transition in Thailand from non-piped improved supplies (rainwater harvesting tanks) towards piped supplies. In many cases, it is in the interest of service providers to connect households that were previously served through household supplies, because with a larger number of households, they can generate more revenue, usually at a better economy of scale. Moreover, once the government has invested in such infrastructure, it may require people to connect to the network, as has been done in various European countries.
- **Facilitation of connection fees and processes.** Connecting to a piped supply may be hindered by several reasons as elaborated in Alvarez (2019) based on experience from Latin America. Owners of household supplies may not always be willing to give up their existing supplies, or not able or willing to cover the costs associated with connecting to a communal supply. Or, those who are already connected to a piped supply do not want any new users, out of fear that the water supply system runs dry, or they set a prohibitively high connection fee. Smets (2021) reports similar limitations for countries in the Danube region and suggests a combination of awareness raising for owners of household supplies and targeted subsidies for connection fees. Or, as Franceys and Gerlach (2006) indicate, waiving connection fees altogether may in fact be the most appropriate mechanism to encourage people to connect.
- **Obligation to connect.** In some countries, a household may be obliged to connect to a piped supply, in case such a network is present near the homestead; likewise, service providers are obliged to provide a connection to all households in their service areas. This is usually the case in middle- and high-income countries, where there are widespread distribution networks in which high levels of service are already provided to those who are connected.

Summarising, the following system interventions can be undertaken to facilitate or accelerate the transition from basic to safely

managed services in settings where populations rely on household supplies.

Table 4: Systemic interventions in each of the building blocks to transition to safely managed services for household supplies

Building block	Systemic interventions
Policy legislation	• Setting water quality standards and risk-based approaches that are differentiated for household supplies • Developing legislation around obligation to connects
Institutions	• Defining mandates for health and environmental authorities to explicit regulate and support household supplies
Infrastructure	• Establishing programmes for supported self-supply, either to develop improved supply systems, or for smaller incremental improvements • Establishing programmes for expansion of piped supplies in dispersed rural areas
Regulation	• Linking regulatory oversight over household supplies to support programmes
Monitoring	• Establishing baselines around the status of household supplies with periodic/regular water quality testing
Finance	• Providing small-grants or subsidy schemes for gradual improvement to household supplies

4.2 Communal rural water supplies

Characterisation of the transition pathways

In nucleated rural villages, growth centres and small towns, community-managed water supply is the predominant service delivery model. This may take many forms, but for this paper the two most important technology groups are:

- Community management of point sources (boreholes with handpumps, kiosk-based systems or piped supplies with public standposts). These systems are by definition considered basic, as they don't provide water on premises.
- Community-managed piped supplies with household connections. Depending on whether water is made available when needed, and on water quality, these supplies can be considered as a basic or a safely managed supply.

There are three potential pathways for these types of water supplies to transition to safely managed services, as shown in Figure 6.

- Pathway 1 involves moving directly from point sources to safely managed, household-connected piped water supplies, using interventions focused on ensuring households connect to existing or new well-managed piped supplies.
- Pathway 2 involves first a transition from handpumps to piped supplies with public standposts, provided through a newly constructed or extended piped scheme, followed by a transition to household connections.
- Pathway 3 involves the improvement of water availability and water quality within a piped supply scheme which has household connections already. This pathway can be preceded by pathway 1 or 2.

The first two pathways thus focus on transitioning to household-connected piped supplies, and the third pathway centres on improvements of water quality management and supply continuity.

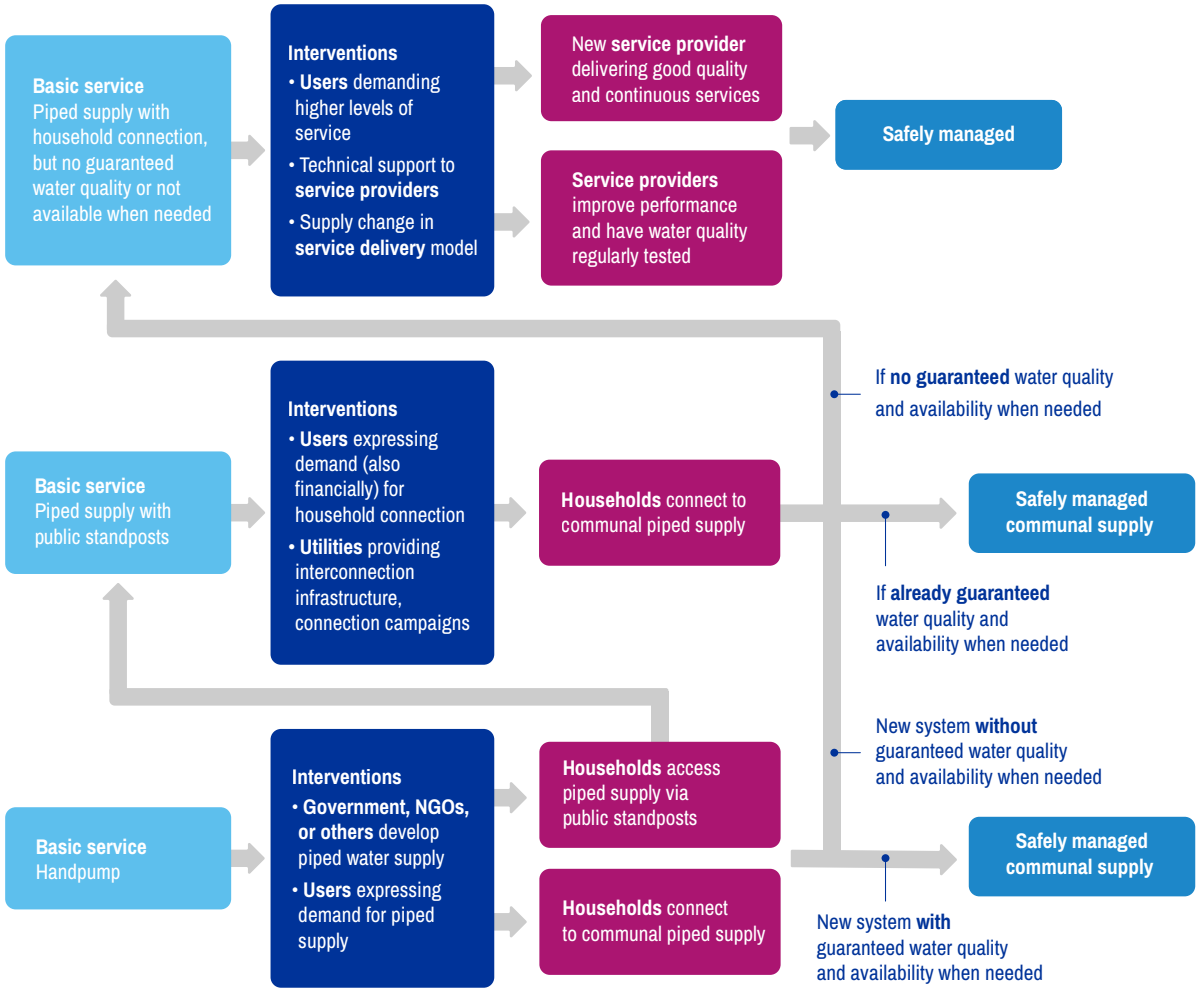


Figure 6: Transition pathways for communal rural water supplies in villages and small towns

Systemic drivers and interventions

There are multiple drivers and underlying factors that are not always brought together in a comprehensive approach, but some general trends and approaches can be proposed.

Pathways 1 and 2: 'household connections'

- **High-level political government leaders and officials** are driving these pathways by setting goals and targets focused on piped water supply and household connections. In India, for example, the Jal Jeevan mission envisioned to provide safe and adequate drinking water through individual household tap connections by 2024 to all households in rural India (Jal Jeevan Mission, 2021). In many other countries, government leadership also set ambitious targets related to ensuring safely managed piped water services, including Rwanda (WASAC, 2022), Bangladesh (General Economics Division, 2020), Malawi (Ministry of Water and Sanitation, 2023), Nigeria (Federal Ministry of Water Resources, 2022). According to the 2025 GLAAS data (WHO 2025), the majority of countries that had provided data had reported to have set targets for safely managed rural (53 per cent) and urban (68 per cent) water supply. In Nepal, for example, the Sixteenth Plan (Fiscal Year 2024/25 – 2028/29) refers to 'clean' rather than to safely managed water supply, and in Tanzania, the National Five Year Development Plan 2021/22 - 2025/26 sets targets for water coverage in terms of the

percentage of the population with access to piped or protected water as their main source (and hence at least basic water supply) (Ministry of Finance and Planning, 2021).

- In countries where the standard model for rural water supply has long relied on boreholes with handpumps, **national government and agencies** can play a role in transitioning towards piped schemes by promoting, facilitating and prescribing piped water supply, as seen in Malawi (National Planning Commission, 2020). Even in the absence of a clear strategy some countries are not initiating new handpump programmes, so the sector is de facto shifting to introduction and extension of piped schemes in rural areas. Even if these do not initially provide water services on premises (but through kiosks for example), it is an essential first step in the transition from improved or basic services through point sources towards safely managed water supply through pathway 2.

- **Water service providers**, both private operators and public utilities also drive the transition away from communal point sources to household connections. This is driven by their realisation that providing piped water and/or water on premises can contribute to increased revenue. In Ghana, for example, Safe Water Network started off with small networks with public standposts and kiosks, but quickly moved to household connections in order to increase water sales (and revenues) (Ampadu-Boakye, et al., 2021). In order to incentivise households to connect, service providers can apply mechanisms such as waiving connection fees or minimising the costs of physical connections. The application of different payment mechanisms (pre- or rather post-payment) may also help in moving to household connections, as shown by cases of private water supply operators in rural Mali and Ghana (Smits and Mekonta, 2023).

- **Water users** have been a major driver of the transition from communal point sources to household connections, demanding (explicitly or implicitly) for water on premises. This is reflected in the quick uptake of household connections promoted by governments and service providers. The convenience of having water on premise, and/or not having to manually pump water (reflected in the popularity of kiosks in the Central African Republic, Zimbabwe, reverse osmosis plants in India) has not only driven users to demand and acquire household connections, but also political leaders to set goals and targets accordingly. This is in turn driven by demographic change, increased wealth, and a sense of modernity.

Pathway 3: 'services that are free of contamination and available when needed'

- Systemic interventions by **technical government departments** include programmes focused on professionalisation of service providers which are 1) more business-oriented and able to develop and run piped supplies, and 2) more focused on gradual performance improvement. In line with the systems interventions above related to pathway 1 and 2, this can involve promotion of 'utilitisation' of rural water supply (Adank et al, 2021). Based on a case study review, these authors identify three mechanisms for such utilitisation:

- service delivery-model change (e.g. Uganda)
- establishment of rural utilities (e.g. CWSA in Ghana becoming a rural utility or the creation of rural utilities in Ethiopia),
- expansion of utilities into rural areas (e.g. in Ethiopia and several European countries), and introduction of new service delivery models (e.g. Safe Water Enterprises)

- Furthermore, this can involve the establishment of institutions and programmes that are dedicated to providing ongoing technical support to community-managed rural piped water supplies. Examples include the rural water programme in Chile and some of the other Central American countries with circuit riders supporting piped scheme management.

- Water **sector regulators and health and environmental authorities** mainly play a role in pathway 3, promoting a stronger focus on water quality and continuity among rural service providers and therefore in the transition towards water supply that is available when needed and free from contamination. Mandates for water quality and service provider performance monitoring in rural areas are often not clearly defined. Systems interventions that regulators and

environmental authorities could take include clarifying these mandates and strengthening procedures and practices accordingly. For example, in a number of Latin American countries, regulators have tried to improve performance of rural service providers around water quality and continuity by setting, monitoring and enforcing performance standards. However, the results have been more modest (Alvarez et al, 2024), with a lack of enforcement in particular hampering improvement of water quality and availability.

- Next, or as part of this, utilities can take advantage of technological developments. The uptake and application of new technologies – such as household connection metering and mobile-money payment systems – have improved service continuity and quality and enable the transition.
- Finally, this shift will be influenced by demand from **water users.** Here the demand refers to a combination of: 1) explicit expectations and claims that users place on their service providers for good quality and reliably available water, and holding providers to account for that; and2) a willingness to pay for more assured quality and continuity of supply. Interventions may therefore focus on strengthening the mutual accountability between users and service providers for these service characteristics.
- Summarising, the following systemic interventions can be undertaken to facilitate or accelerate the transition from basic to safely managed services in settings where populations rely on communal rural water supply.

Table 5: Systemic interventions in each of the building blocks to transition to safely managed services for communal rural water supplies

Building block	Systemic interventions
Policy legislation	• Setting national targets for having water on premise and/or safe and reliably available water for everyone. • Elaborating these high-level targets into detailed targets, programmes and plans.
Institutions	• Supporting, facilitating and/or prescribing a shift from community management to other management models. • Supporting and facilitating professionalisation of community-based managed. • Supporting the transition from community-managed to utility-managed rural water supply. • Establishing institutions and programmes that are dedicated to providing ongoing technical support to community-managed rural water supplies.
Infrastructure	• Changing different technology standards, from handpumps to kiosks, to piped on premises. Accompanied by different design norms. • Promoting and applying technologies for household water metering and payment.
Regulation	• Setting performance standards for rural service providers (financial, water quality, continuity service levels), and ensuring monitoring and enforcement of these.
Monitoring	• Providing clear mandate for water quality and service provider performance monitoring in rural areas for regulators and public health and environmental authorities.
Finance	• Have clear financial, and when needed, subsidy mechanisms to stimulate and enable households to connect to piped schemes. • Have clear financial mechanisms in place to ensure sustainable and continuous water service provision by piped-scheme service providers.

4.3 Connections to distribution networks in (peri)-urban areas

Characterisation of the transition pathway

In cities, water services are commonly delivered through household connections to piped systems managed by a utility. This service delivery model has significant potential to provide safely managed services. In densely populated urban areas, econ-

omies of scale make it feasible to operate water distribution networks with household connections. Utilities can have the professional capacities, procedures and business models needed to ensure water on a continuous basis, and to treat water to the required quality standards. Globally, 84 per cent of the urban population receives safely managed water supplies (WHO/UNICEF, 2025).

This does leave some 13 per cent of the global urban population, i.e. more than 600 million people, with only basic access to services. They are mostly living in Sub-Saharan Africa (189 million people), Eastern and South-Eastern Asia (182 million people) and Central and Southern Asia (117 million people).

The specific situations in which basic services are supplied, instead of safely managed ones, include the following:

- Households, or even entire neighbourhoods, are served through public standposts and kiosks, rather than through household connections. Utilities either operate such kiosks themselves or do so via intermediaries (private kiosk owners, vendors or community-based organisations) who purchase water in bulk from the utility and then re-sell it to households.
- Other service providers (such as community-based organisations) who manage other water supply systems (point sources or piped supplies) that are within the service area of a utility, or on its fringes, and which may fail to meet one or more of the criteria for safely managed services.
- Household-managed supplies that exist within the service area of the utility. Here households themselves have or develop their own wells, even if they live in the service area of the utility. The JMP data indicate that whilst the percentage of urban population in South Asia and Sub-Saharan Africa with safely managed water has increased over the past 20 years, the percentage of people served via non-piped systems has increased relatively to those with piped supply. This implies an increase in the number of people who have developed their own non-piped supply because piped systems have not expanded quickly enough. Such household-managed supplies in urban areas may face the same challenges and opportunities as those described in Section 4.1.
- Households that are connected to a utility-managed piped supply, but where the supply is irregular and the water is not available where needed, or where the water quality is compromised due to inadequate treatment, or re-contamination within the distribution network.

The underlying systemic causes for these situations are manifold and include:

- Utilities that underperform in expanding service provision at a pace that matches population growth, and/or in their operational processes of water treatment and distribution. These shortcomings often stem from limitations in the technical, financial or commercial management of the utility, as widely documented in the literature on utility performance (e.g. Soppe et al., 2018).
- Rapid and difficult to manage expansion of urban fringes, where cities extend into formerly rural areas. These areas often already had some water supply infrastructure and associated management arrangements, contributing to the patchwork of service arrangements in the peri-urban fringes. This pattern is well-illustrated in several city-level case studies, including Dar es Salam, Tanzania (Truelove, 2019) and Lagos Nigeria (Akinbode, 2010).
- The politics of those other pre-existing service providers, particularly intermediaries. Utilities in many cases preferred to work with intermediaries as the provision of water, particularly in low-income areas, comes with relatively high administrative costs and risks: more metering, often in complex dense low-income areas; more administrative challenges in billing and collecting small amounts of tariff payments from households considered to consume relatively small amounts of water. It may be easier for the utility to provide water 'in bulk' to intermediaries and shift all the risks of non-payment to these intermediaries. So, utilities may not want to move away from intermediaries. But also in some cases, the intermediaries operate as cartels, using their monopolised position to extract financial gains from users, as elaborated in Boakye-Ansah et al. (2019a). Once established, such intermediaries have a vested interest in maintaining kiosks and other point sources, rather than seeing households transition to household connections.
- Lack of confidence from households that the utility will provide reliable, high-quality services, leading many to invest in

their own boreholes. Although that may provide those households with safely managed services, it deprives the utility of possible paying customers, further undermining the financial viability of the utility.

- Financial and regulatory constraints around household connections. In many countries and cities, formal regulations require users to pay a one-off connection fee as well as the costs of the physical connection (i.e. the costs of a meter and a short connecting pipe). These high upfront costs may prevent people from obtaining a connection, a phenomenon that Franceys and Gerlach already labelled in 2006 as "charging to enter the water shop". It not only prevents people from the benefit of a household connection, but also reduces utility revenue, since connected households typically consume more water, and contribute more income than users who rely on standpipes. Even though there is growing recognition that these 'connection fees' have a perverse effect, the practice remains widespread.

As with communal water supplies, the transition trajectories differ depending on whether households currently rely on a public access point (through an intermediary or directly from the utility) and first need to get a household connection, or whether they already have household connections but are served by a network with inadequate water quality and availability. Based on this, the figure below shows three pathways:

- The first pathway involves a shift from non-piped water supply to household connections;
- The second pathway involves a shift from access to communal water points connected to piped water schemes, e.g. through kiosks or intermediate water vendors, to household connections;
- The third pathway involves a shift from basic supply provided through household connections to safely managed water supply through interventions ensuring that water is available when needed and free from contamination.

Although all these three pathways may appear to be about technological changes, they can only be achieved by deeper systemic changes in utility performance improvement, and the relations between utilities, users, other service providers and intermediaries.

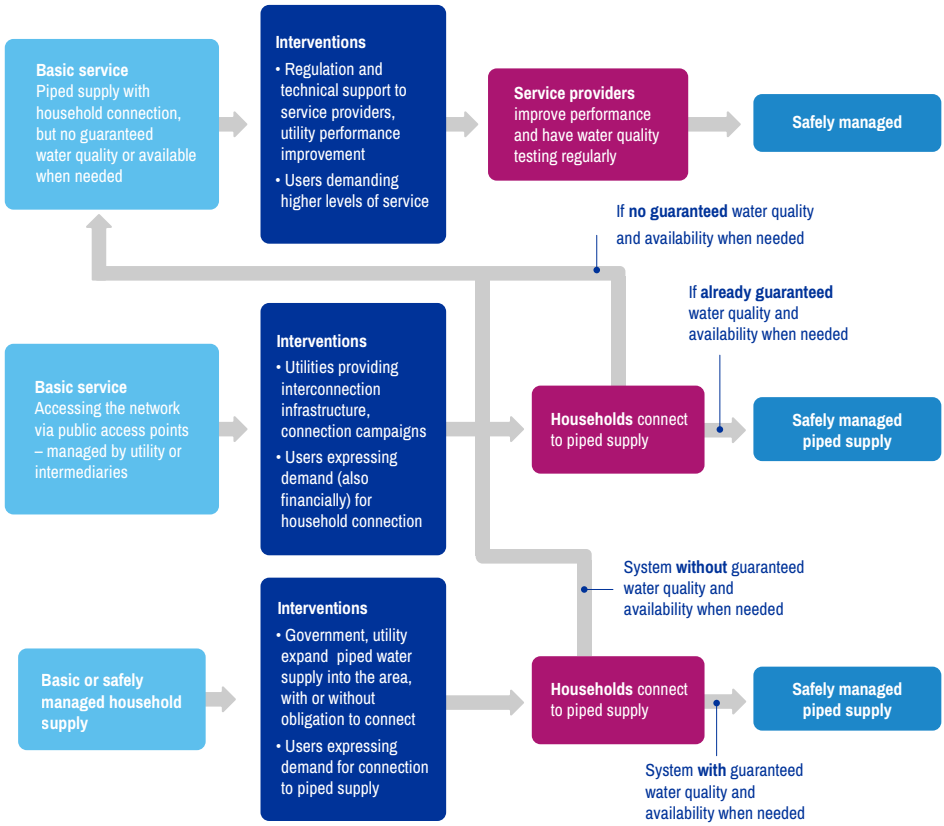


Figure 7: Transition pathways for utility-managed water networks in peri-urban and urban areas

Systemic drivers and interventions

Pathways 1 and 2: household connections

Addressing the underlying systemic challenges of utilities that fail to meet their mandates for expanding services to all customers in their service area begins with (political) leadership from **city and other authorities who sit on utility boards.** Extensive literature on utility performance improvement and turnaround emphasises that any such process starts with leadership. In the specific context of shifting to household connections, the leadership needs to be expressed through:

- Setting targets and strategic directions for the expansion of the customer base of the utilities. This can be through: 1) densification, whereby household connections are increased within existing service areas, 2) expansion of service areas to new neighbourhoods, or 3) taking over service areas from other service providers (informal or formal).
- Leading stakeholder engagement processes with actors who can be expected to oppose such expansion including through household connections, such as intermediaries, other service providers and even users themselves.
- Issuing supportive legislation and regulation. For example, the authorities can adopt by-laws and regulations that require households to connect.

Utilities and other formal service providers can introduce a number of financial and regulatory measures to expand household connections through:

- Building the business case for household connections, alongside intervention strategies. It is in the interest of the utilities to provide household connections to prospective users, also in low-income areas. They can increase their revenue by expanding the number of household connections, since consumption from household connections tends to be higher than from public standposts, which utilities generally cannot charge for. But because the administrative costs are also higher, a specific business case needs to be built for the transition, particularly in dense low-income areas. Some utilities therefore establish dedicated low-income units that develop and implement specific strategies for that purpose (Boakye-Ansah, 2019b). These strategies should critically include engagement with stakeholders who may oppose or resist the transition, such as intermediaries.
- Utilities, supported by regulators and authorities to address challenges of high connection costs by waiving or minimising these fees. As described above, such connection fees are increasingly seen as a perverse measure for moving towards household connections. If regulatory requirements prevent the utility from waiving these fees, it can still develop payment mechanisms that lower these barriers (Smits and Mekonta, 2023). These could include paying the connection fees in monthly instalments, applying cross-subsidies, offering micro-finance for household connections, and increasing the payment frequency.
- Utility master planning, where concurrent investments are considered in production capacity, water treatment, and other major infrastructure, as well as in densification. A rapid increase in household connections will also, in many instances, require investment in bulk infrastructure. Moreover, upgrading the distribution network to enable household connections also requires investments. Master planning and financial resource mobilisation for the two types of investments need to happen concurrently.

As mentioned above, **intermediaries** may actively resist pathway 2, as they could lose monopoly positions. Therefore, they need to be brought into the dialogues and processes of shifting away from kiosks towards household connections. Authorities, utilities and community groups can exercise pressure on this. If well-managed, intermediaries may opt to be formalised as salaried utility staff, for example in metering roles. This has happened in Tanzania, where utilities have taken over scheme management from community-based organisations and integrated their staff.

The same applies to **other service providers** on the fringes of the network of a utility, including owners of household supplies. They may either resist incorporation into the utility's service area or choose to cooperate. Similarly, as for intermediaries, they may therefore need to become part of the dialogues and processes of shifting towards household connections under pathway 2. There are ways in which they can maintain a role in water supply. For example, community-based service providers can re-

ceive water in bulk from the utility and manage distribution to users, and may in turn also prefer to transition towards household connections.

Regulators have the potential to contribute to pathways 1 and 2. The most important contribution is arguably the general role that regulators have in promoting and enforcing utility performance improvement. They can also take specific systemic measures such as:

- Setting performance targets for utilities, such as the percentage of the served population receiving water through household connections and requiring utilities to report against these targets.
- Focusing on 'regularising' unauthorised connections, as is done in some countries. This does not imply a material change in having access to safely managed water – but it helps utilities in maintaining that level of service.

Water users in low-income urban areas can be drivers of the transition, demanding (explicitly or implicitly) for water on premises. Users may also resist. For example, owners of private wells and boreholes may not want to be connected to a piped network, particularly if these are providing a basic (or even safely managed) service but require paying of tariffs. To maximise user demand for household connections, utilities can, for example, organise promotional campaigns. Awareness-raising campaigns can focus on possibilities and specific facilities. At the same time, it is also an opportunity for a utility to transition a large number of users (e.g. an entire neighbourhood where the campaign is held) in one go.

Pathway 3: 'improved water quality and availability'

In this pathway, the transition to safely managed services involves **utilities** enhancing service levels for those on the network by improving water quality, quantity and reliability. While this is often a gradual process, it can be accelerated through dedicated utility turnaround initiatives. Such initiatives focus on systemic improvement across all the utility's work processes, including the technical, financial, commercial, environmental and human-resources domains (Soppe et al, 2018).

The desire of utilities to improve service continuity and water quality can be a driver to embark on a utility turn-around process. However, this is frequently part of a broader ambition to improve utility performance, often resulting from strong and ambitious leadership (e.g. the well-known and documented turnaround of the Phnom Penh utility in the 1990s)**,** by benchmarking, or by regulation (by regulatory agencies or through contracts). In fact, improving work processes related to water availability and quality may represent only a small part of a turnaround process, whereas the changes in the financial, commercial and human-resources domains are often necessary to achieve improved water availability and quality.

City authorities and utility boards can provide additional political leadership and support in this transition process and give strategic direction to large-scale investments around, for example, water production and treatment, which may be necessary to move towards safely managed services through pathway 3.

There is evidence from a number of countries on how **regulators** have contributed to changes in urban utility performance by setting, monitoring and enforcing service delivery parameters such as water quality and continuity of supply.

Table 6: Systemic interventions in each of the building blocks to transition to safely managed services in low-income urban areas

Building block	Systemic interventions
Policy legislation	By-laws and regulations on 'obligation to connect' By-laws and licenses for the service area of utilities and their relationship with intermediaries and informal providers Technical norms and standards on household connections vs public access points
Institutions	Clarifying institutional relations between utilities, intermediaries and informal service providers around obligations to extend services
Infrastructure	Metering infrastructure and technology Concurrent infrastructure development to improve production capacity and treatment, alongside programmes to extend household connections
Regulation	Establishing service level performance standards, monitoring and enforcing them Developing regulations on connection fees, and the way these can be paid for
Finance	Minimising connection fees and/or developing mechanisms for paying these in a way that lowers barriers Developing payment modalities that fit household connections

5. The transition towards safely managed sanitation

This section describes the transition to safely managed sanitation in urban and rural settings. It differs slightly in structure from the water supply transitions as it reflects the character of the sanitation sub-sector. It focuses on identifying the dominant pathways observed in specific country contexts and then elaborates what these pathways look like before discussing the systemic drivers and interventions associated with each. It ends with an overview of key shifts in the building blocks to accelerate progress to safely managed sanitation for rural and urban areas.

5.1 Safely managed sanitation in rural settings

Characterisation of the transition pathways

Historical experience—from 20th century England —shows that the transition to safely managed rural sanitation is typically slow, uneven, and characterised by a mix of technologies and service delivery arrangements, including on-site sanitation systems and sewer-based sanitation (Franceys and Hutchings, 2026). To understand the dominant transition models today, this section starts by contrasting the different but complementary pathways taken by the two largest countries that have made substantive shifts in safely managed rural sanitation in recent decades: China and India.

In China, safely managed sanitation coverage in rural areas remains partial (38 per cent), although almost all rural households now have at least basic sanitation (WHO–UNICEF, 2025). China's trajectory has been driven by state-led programmes that combine a mix of technologies with long-term institutional and large-scale capital funding from government. This has supported a gradual shift from simple pits to a wide array of 'harmless sanitary toilets', including three-chamber septic tanks, double-vault and alternating-pit dry systems, urine–faeces diversion toilets, biogas-linked units, and flush toilets connected to sewerage and wastewater treatment (Cheng et al., 2017). Despite the diversity of sanitation systems, safely managed services in rural China are primarily achieved where sewerage has been extended into villages (WHO–UNICEF, 2025). There remains limited, safely managed faecal sludge management, which means the other forms of on-site sanitation systems do not meet the safely managed threshold, as they are not amendable to safe disposal in situ.

In India, an estimated 62 per cent of the rural population now have safely managed sanitation, achieved predominantly through safe in situ disposal (WHO–UNICEF, 2025). India's transition was shaped by the Swachh Bharat Mission (SBM) focused on ending open defecation, but which also accelerated the uptake of twin-pit pour-flush latrines, which is a safely managed technology because it enables on-site treatment and safe pit alternation. The reality of whether these systems are safely managed will be tested in the coming years, as the pits constructed during SBM fill up and the need to empty them or shift to the second pit becomes a reality. India has set up various interventions—such as national design standards, mason training, digital monitoring platforms, and the gradual institutionalisation of faecal sludge and septage management—to strengthen that service chain performance. This will need to function well to ensure the country maintains and grows the level of safely managed sanitation, as a significant growth in faecal sludge management is needed.

These two experiences illustrate dominant transition pathways that often unfold in parallel. **Pathway 1 centres on appropriate on-site containment technologies**, that enable safe treatment and disposal in situ. These include high-quality pits, such as twin-pit pour-flush latrines, that do not require managed desludging or, even, single pits that have sufficient lifespan that households can move to a new pit when it is full. This pathway is the most efficient from going from no sanitation access or unimproved sanitation systems, straight to safely managed sanitation. However, it requires attention to proper design, siting and construction of improved pits, and is only feasible under certain terrain conditions and user preferences. Global data indicate that this is the pathway currently pursued by most low-income countries, although there is uncertainty about whether many of these systems will be safely managed over the long term. In practice, apart from in some exceptional circumstances, it is likely that pathway 1 will need to be followed by pathway 2 eventually for safely managed services to be retained over the long term.

The complementary **pathway 2 to safely managed sanitation via on-site containment is through faecal sludge management (FSM)**. However, globally, of the over 1.6 billion rural people estimated to have safely managed sanitation, only 2.8 per cent have achieved this through faecal sludge management, with such cases occurring almost exclusively in Europe, North America and Oceania. Evidence suggests that there is variable and often low willingness to pay for faecal waste management beyond the household level (Tomoi et al., 2024; Lyu et al., 2025), making the development of safely managed rural sanitation via the faecal sludge management model a considerable challenge. There is evidence from Indonesia that with careful design desludging can be priced in a way that aligns with rural population's willingness-to-pay for around 47 per cent of the actual service cost, indicating that some form of public subsidy is likely needed to enable this transition in some contexts (Balasubramanya et al., 2017).

A recent desk review synthesises a small but diverse set of rural FSM models (USAID, 2024). It documents nine examples **(**with five core rural or peri-urban cases) and demonstrates how safely managed FSM can be realised in rural contexts. Among the reviewed examples, Dhenkanal, India, provides an example of how an urban faecal sludge treatment plant (FSTP) is used to serve surrounding rural settlements within a 20 km radius. In eThekwini, South Africa, the municipality provides a free emptying service – funded by public funds – although it is delivered through a regulated contract with private suppliers. Meanwhile, Khadak, Nepal showcases a municipality-led licensing system in development, aiming to regulate and support private sludge emptying operators to use a trench-based treatment site, indicating how local governments can gradually shift from informal FSM towards safer, more formalised services. However, these examples tend to be quite piecemeal and small-scale initiatives.

To look at rural FSM at scale, it is useful to briefly look at high-income country contexts where this is happening. Finland provides a strong example of safely managed rural sanitation in a high-income setting, with around 600,000 properties using on-site systems such as septic tanks and small-scale treatment units (Tenhuen and Litmanen, 2022). Desludging is typically required every 1–3 years, and services are often municipally coordinated. While some challenges remain around enforcement, Finland's model shows how clear regulation, local oversight, and structured service provision can support safely managed sanitation in non-sewered areas.

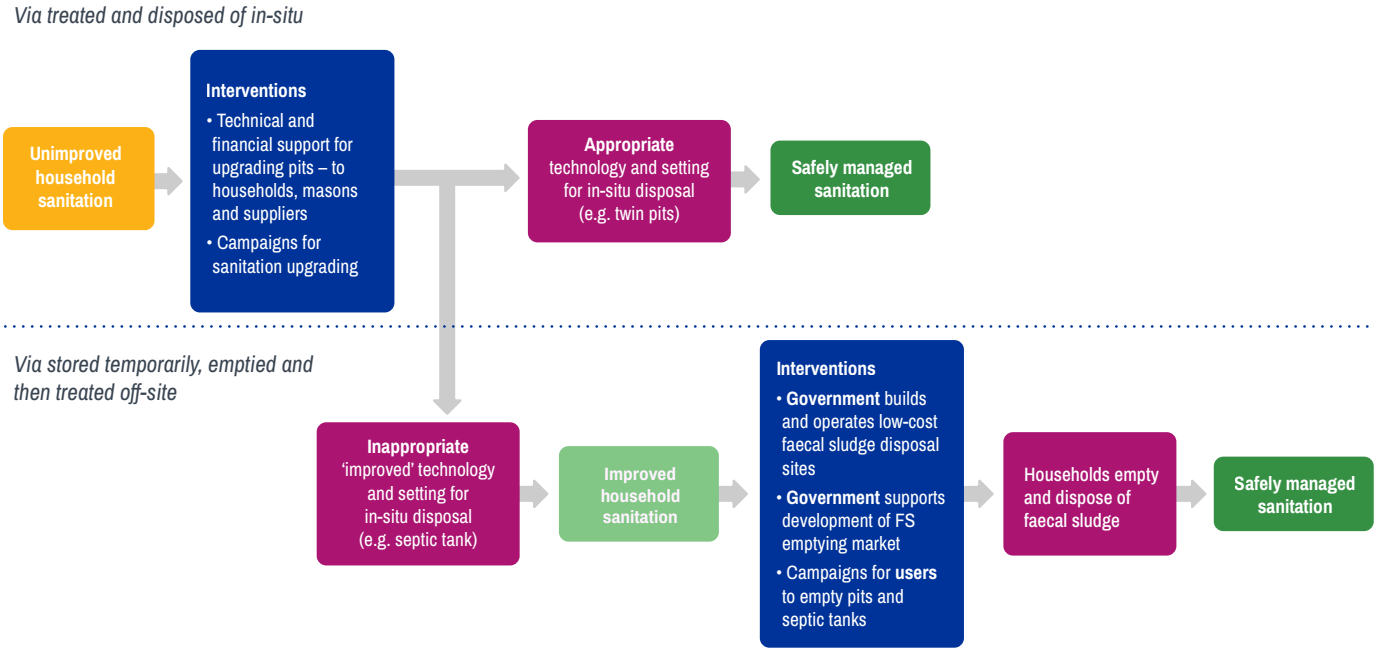


Figure 8: Transition pathways for rural sanitation through on-site containment and in situ/off-site disposal

Pathway 3, exemplified by China but also seen in Mexico and Peru, **involves the progressive extension of sewers and wastewater treatment into rural settlements.** This networked pathway depends on sustained public investment, clear institutional mandates, and integration with environmental management goals. While more capital-intensive, it offers a durable route to safely managed sanitation where demographic and fiscal conditions allow. In contrast to on-site systems—where households are the foundational actors—the sewer pathway places a much heavier reliance on public authorities, utilities, and environmental regulators to drive the safely managed transition.

Global data show that 23 per cent of the rural population with safely managed sanitation have sewer systems, however, this varies widely between global regions. In sub-Saharan Africa, it is only 0.5 per cent, whilst in Latin America and the Caribbean it is 11 per cent, in Eastern and South-Eastern Asia 19 per cent, in Northern Africa and Western Asia 26 per cent, up to 48 per cent in Europe and Northern America. Hence, although sewers are not conventionally promoted as viable within rural areas of low- and middle-income countries, they do play a significant role in ensuring safely managed sanitation for hundreds of millions of people.

As shown in Figure 9, within the sewer-based pathway, there are two typical 'sub-pathway'" focused on: 1) a model that emphasises extending centralised, bulk sewer systems from cities out into rural areas with large-scale municipal treatment, or 2) decentralised sewer networks linked into decentralised wastewater treatment systems. Both sub-pathways are further elaborated in the sections below.

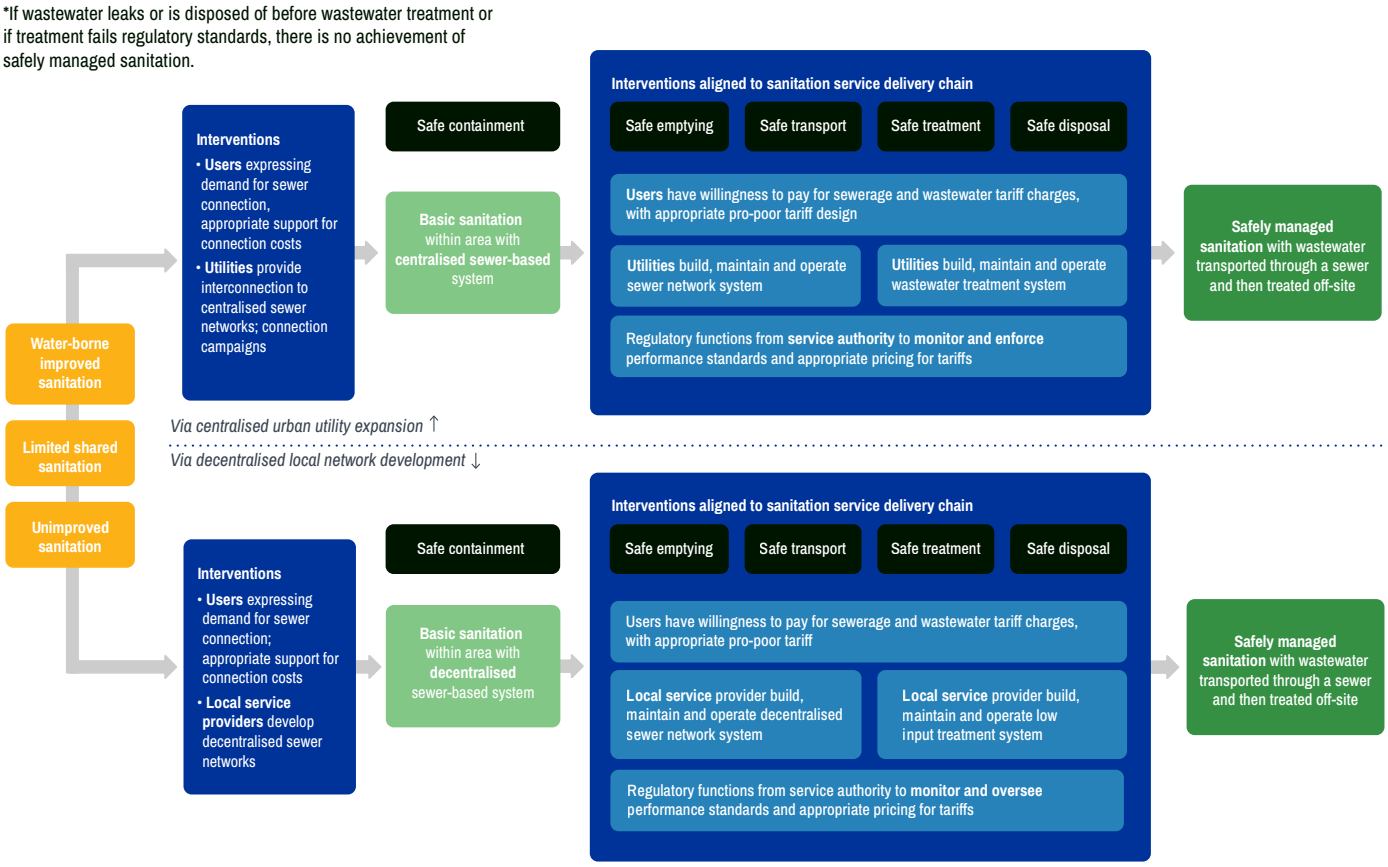


Figure 9: Transition pathways for rural sanitation through sewers*

Systemic drivers and interventions for safely managed rural sanitation via on-site containment

Considering both pathways for safely managed sanitation in rural areas via on-site containment – via the in situ disposal and FSM, we can suggest the following priorities for key groups to help support this transition. They are presented together to partly reflect the reality that in most cases it is not viable for all households to be able to transition via in situ disposal alone, so in practice, governments and other actors should pursue both pathways in parallel.

- **Households** choose whether and when to upgrade their facilities, invest in constructing improved pits or septic tanks, and maintain systems through proper use and timely desludging or pit alternation. Households also play a critical role in creating demand for safe desludging: without user willingness to pay—and trust that services will be delivered safely— FSM service chains cannot operate sustainably, or the state must take a proactive decision to fund via general taxation. But even in state-funded schemes, households must actively participate in schemes to grant access to their facilities, and so they are foundational actors for enabling the transition to safely managed sanitation. Systemic interventions that support households to make informed decisions are therefore essential, including behavioural and communication campaigns and the use of subsidies where affordability is an issue.

- **Private sector: masons and construction service providers -** masons are the de facto engineers of rural sanitation systems and they determine whether pits, septic tanks and superstructures meet the safety and durability requirements needed for safely managed sanitation. Strengthening the skills, certification and oversight of private sector masons therefore becomes a core system intervention, ensuring that household investment results in high quality on-site facilities.

- **Private sector: desludging service providers:** in many cases, private operators form the operational backbone of FSM systems, with ranging levels of formality. They provide desludging services; however, their incentives depend heavily on regulation and market conditions. Expanding into rural markets often requires new business models—such as community contracts, instalment payments, or shared emptying services—to make businesses viable.

- **Community-based organisations and frontline workers:** community groups, health workers, and sanitation volunteers often play an intermediary role between households and state institutions. They help deliver public health and behaviour change campaigns and can also identify failures—collapsing pits, full septic tanks, or areas where illegal dumping is common—and therefore contribute to regulatory functions.

- **Local governments and district authorities:** Local governments should drive the strategic transition from basic to safely managed sanitation in their jurisdiction. They should play an enforcement role: certifying compliant construction, regulating unsafe disposal, and taking action when systems pose public health risks. While regulatory capacity may be limited in many rural areas, even modest oversight can help shift local systems away from unsafe dumping and towards structured management of sludge.

- **National governments:** National governments shape the overall policy direction and normative standards, by defining what constitutes safe containment, establishing technology standards (e.g. twin-pit latrines, lined pits, septic tanks), and setting expectations for desludging and sludge disposal.

Systemic drivers and interventions for safely managed rural sanitation via sewer-based systems

As shown in Figure 9 above, in rural areas, there can be a sewer-based sub-pathway of connecting communities into centralised sewer networks and wastewater treatment systems. This is especially effective for 'close to urban' rural areas whereby villages can be connected to trunk sewers and existing treatment systems. But there can also be a different sub-pathway strategy that emphasises more localised treatment systems, such as those called Decentralised Wastewater Treatment Systems (DEWATS). These include decentralised treatment systems which are ideally low(er) maintenance, such as baffled septic tanks and settlement ponds (BORDA, 2009), and which are served by localised sewer networks. It should be noted here that decentralised systems bring significant risks as they still require professional operation and having many smaller treatment plants can

create the situation with many failed units, unless the professional operations are well planned.

The Brazilian experience shows how small treatment plants can serve rural clusters of villages (often under 30,000 people), with local pipe networks or 'satellite' sewers collecting domestic wastewater within a radius of a few kilometres (Ferreira et al., 2021). These systems are now explicitly recognised in the National Basic Sanitation Plan as part of the strategy to reach 85.6 per cent wastewater treatment by 2033. Similarly, systems exist elsewhere, such as decentralised, sewer-based DEWATS in Lao (BORDA Lao PDR/ADB, 2018). Together, these cases suggest that in rural and peri-rural settings with clustered settlements, DEWATS is another option to deliver safely managed sanitation.

To help support the transition to safely managed rural sanitation via sewer-based systems, we therefore suggest the following priorities for key groups:

Service providers: Utilities, small operators and DEWATS implementers. Professional service providers and operators are critical for the sewer-based pathway. Utilities can extend trunk or small-bore sewers into dense rural settlements when there are feasible service zones. In doing so, they need to design affordable connection policies and ensure treatment capacity keeps pace with network growth. But utilities may face weak incentives to expand into low-density areas unless backed by subsidies, capital investment, or performance targets.

In decentralised pathways, DEWATS implementers (municipal units, NGOs, or small engineering firms) design and build compact systems serving villages, schools or markets, with local networks channelling wastewater to treatment nodes. Their capacity to design robust systems, train operators, and secure O&M budgets will determine long-term performance and this is often the most difficult challenge.

- **Households** remain central even in a sewer-based pathway. In most cases, they decide whether to connect to a new sewer or decentralised network, whether to pay connection fees and recurrent tariffs, and whether to maintain any remaining on-plot infrastructure such as septic tanks. Their willingness to connect and to pay for sewerage services is therefore a critical enabler of both utility-led expansion and decentralised DEWATS-based systems.
- **Local governments** are pivotal in steering rural settlements towards sewer-based solutions. They convene communities, determine which areas merit utility extension versus decentralised treatment, and secure land for treatment units—often a n decisive factor in rural DEWATS siting, as shown in the case from Lao PDR. Even modest local enforcement and oversight can significantly reduce illegal discharges and protect treatment performance.
- **Community-based organisations and frontline workers:** community groups, village committees and frontline workers can mobilise connection uptake, monitor local sewers and drainage for blockages or breakdowns, and support fee collection where utilities lack a presence. In decentralised systems, they can even become the primary operators of DEWATS units, undertaking routine inspection, minor repairs and coordinating desludging or filter maintenance.
- **National governments and regulators** define the overall strategic direction for rural sewerage: setting effluent standards, clarifying the institutional split between utilities and municipalities, and establishing conditions under which decentralised systems qualify as safely managed sanitation. They determine subsidy policies and investment frameworks that make rural sewer expansion viable. Their ability to certify, monitor and guide decentralised systems is particularly important, given the diversity of treatment configurations and the risks of underperformance if oversight is weak.

Recognising that the progressive realisation of safely managed sanitation in rural areas can follow different pathways, Table 7 synthesises the typical key shifts in the building blocks that can accelerate the overall transition. They are presented in such a way as to cover all possible pathways for rural safely managed sanitation, but in practice governments may choose to focus on a sub-set of these pathways, such as the two associated with on-site containment.

Table 7: Key transition interventions for safely managed sanitation in rural areas

Building block	Systemic interventions
Policy legislation	Clear national policies that recognise multiple rural sanitation pathways—on-site, FSM, utility sewer expansion, small-town sewers, and decentralised systems—help legitimise diverse technologies and service models. Updating legislation to define safely managed standards for containment, collection, treatment and disposal provides the regulatory backbone for coordinated progress.
Institutions	Clarifying the roles of utilities, local governments, community bodies and private operators reduces fragmentation and ensures coherent responsibility across the sanitation chain. Strengthening coordination mechanisms—such as rural sanitation taskforces or inter-departmental planning processes—supports smoother implementation of hybrid service models.
Finance	Ensure service providers develop viable O&M financing models—whether tariff-based or cross-subsidised—is crucial for sustaining safely managed services. Mobilise all levels of government to identify and strategically plan for large capital works to support this transition, such as wastewater and faecal sludge treatment plants, or sewer expansion projects.
Infrastructure	Invest in context-appropriate designs, whether improved pits, septic tanks, simplified sewers or DEWATS modules, enables rural areas to incrementally adopt higher service levels. Ensuring that infrastructure choices are resilient to hydrogeological conditions, climate risks, and future densification strengthens the long-term pathway to safely managed sanitation.
Regulation	Technical standards for containment, sewers, treatment units and effluent quality ensure that both on-site and off-site systems deliver genuine risk reduction. Even modest enforcement—through construction certification, desludging regulations, or inspections of decentralised plants—can substantially reduce unsafe dumping and groundwater contamination.
Monitoring	Monitoring systems that track containment quality, desludging, effluent performance and connectivity gaps to target support and investments more effectively.
Capacity development	Training local masons, operators, utility staff and community committees to build the technical and managerial skills needed to operate more complex sanitation systems over time. Supporting local governments with planning tools, asset registers and regulatory skills helps them steward the transition beyond basic access.

5.2 Safely managed sanitation in small towns and urban areas

Characterisation of the transition pathways

Small towns and urban areas present a different starting point for safely managed sanitation compared to rural settings. Higher population densities, multi-storey housing and limited land availability constrain options for long-term in situ disposal and increase the risks of local environmental contamination. At the same time, a larger share of the population is accustomed to paying regular bills for services such as water, electricity and rent, creating a different set of expectations and possibilities for tariff-based sanitation services. Municipalities or other local bodies are also more likely to regularly collect taxes, creating opportunities for alternative revenue sources to finance systems. However, land tenure is often more complex, with a mix of formal plots, rental accommodation and informal settlements, which shapes who invests in sanitation infrastructure and on what time horizon, which can create intractable equity challenges.

Within these contexts, two dominant service delivery models underpin transitions pathways towards safely managed sanitation: (i) **on-site systems with waste stored temporarily and then emptied and treated off-site**, and (ii) **sewer networks with wastewater and then treatment off-site**. In the first model, households use pits, septic tanks or other on-plot systems, with sludge periodically emptied, transported and treated in dedicated facilities. In the second, wastewater is conveyed off-site via

sewers to treatment plants. Both models can, in principle, deliver safely managed sanitation in dense environments, and both are central to CWIS thinking, which emphasises a mix of service options across cities.

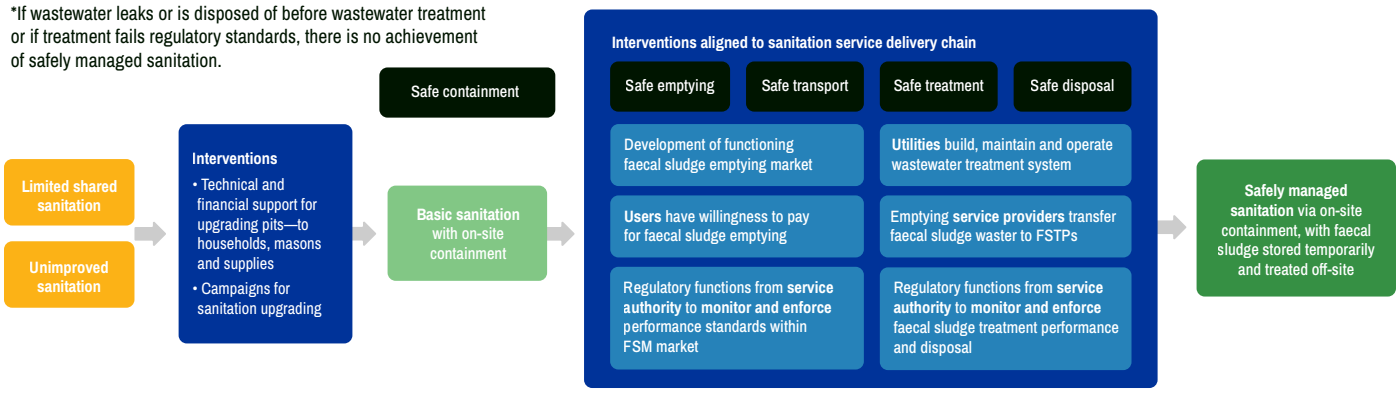


Figure 10: Transition pathways for small town and urban areas through on-site containment systems*

The first pathway of transition to safely managed sanitation starts from widespread but substandard on-site systems and moves towards **professionalised faecal sludge management services.** It includes improving construction standards, regulating emptying services, and investing in decentralised faecal sludge treatment plants or co-treatment at wastewater facilities (see Figure 10).

This pathway of using on-site systems with functioning faecal sludge management is one which has been championed in the past decade, as the most feasible route for delivering safely managed sanitation in many cities in low- and middle-income countries. However, global estimates from 231 countries show that even in Iran – the country with the highest proportion of coverage with this type of safely managed service – it only constitutes 20 per cent of safely managed urban services in total, and in most countries it is much lower. This is because FSM services are frequently underdeveloped and poorly regulated, with a significant portion of waste unsafely discharged into the environment. A comparative assessment of 12 cities found that none were managing faecal sludge effectively along the entire service chain, with multiple failures in containment, emptying, transport and treatment leading to unsafe disposal (Peal et al., 2014). Even more pessimistically, as explained earlier in Chapter 3, recent research also suggests that global estimates may significantly overstate the proportion of safely managed urban on-site systems. Mills et al. (2024) show that when exposure pathways such as animal access to excreta, groundwater contamination, or unsafe emptying are considered, up to three-quarters of systems currently classified as safely managed may pose significant health risks.

Nonetheless, several examples show how progress is possible. In Dakar, Senegal, a public-private model for vacuum truck services, coupled with a faecal sludge treatment plant (FSTP), has become a regional reference point, although challenges remain around illegal dumping and inclusivity (Dodane et al., 2012). Dumaguete, Philippines, developed an integrated FSM system underpinned by city regulation, operator licensing, and scheduled desludging for septic tanks, with strong political backing and technical support (Peal et al., 2014). Clear institutional mandates, enforced design standards, professionalisation of FSM providers and promotion of models such as scheduled desludging coordinated by municipalities, are emerging as key enablers for successful urban FSM.

The second pathway emphasises **progressive sewer expansion**, initially serving dense commercial and central districts and gradually extending to adjacent dense neighbourhoods, using an appropriate mix of conventional deep sewers and simplified

sewers, as appropriate (see Figure 11). Properly managed sewerage offers the highest levels of public and environmental health protection, especially in dense urban areas where on-site options are infeasible, and it is the only service delivery model that has categorically been shown to have measurable health benefits (Wolf et al., 2023). However, while access to sewerage is increasing in some countries, connection rates often remain low even where networks exist. In Dhaka, for example, although much of the city is now served by foul-water sewers, only 20 per cent of residents are connected and just 2 per cent of wastewater is treated effectively (Alam et al., 2025a).

In addition to limited household connections, many urban areas struggle with aged infrastructure, dysfunctional pumping stations, and illegal connections to stormwater drains (Alam et al., 2025a; Yap et al., 2023). Conventional sewerage can be prohibitively expensive in lower-income areas, requiring deep excavation and costly materials. Simplified or 'condominial' sewers are widely used in Brazil and increasingly in Africa, including in Tanzania (Tilley et al., 2014; Yap et al., 2023).

Despite these challenges, sewerage remains an important option for safely managed urban sanitation—particularly when paired with on-site sanitation as part of a city-wide approach. As with other sanitation approaches, the barriers are not only technical but also institutional, financial, and behavioural.

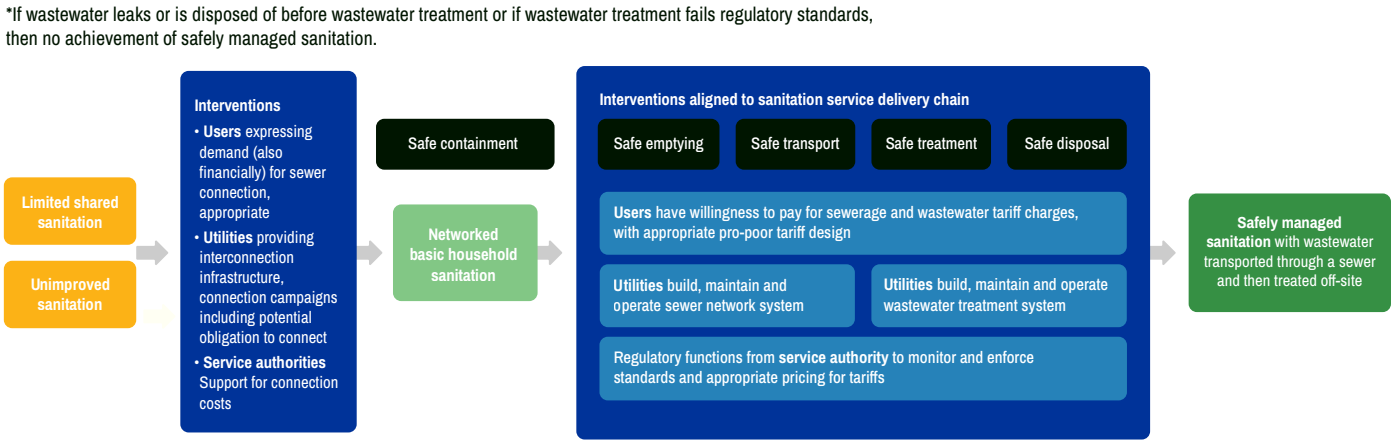


Figure 11: Transition pathways for small town and urban areas through progressive sewer expansion*

Systemic drivers and interventions

For **Pathway 1 'professionalised FSM'**, we suggest the following priorities for key groups supporting this pathway:

- **Municipal governments and public authorities:** Municipal governments are usually the de facto service authorities for urban non-networked sanitation. They often own or oversee faecal sludge treatment infrastructure, regulate emptying services and are responsible for enforcing construction standards. Yet in many cities, mandates are fragmented across departments or tiers of government, and on-site sanitation teams lack the authority and technical capacity enjoyed by utilities managing sewerage. Where municipalities have taken a more active role – such as in Dumaguete, Philippines, or Dhenkanal, India – progress has hinged on dedicated staff, clear political backing, and mechanisms for coordinating actors across the FSM chain (Peal et al., 2014; USAID, 2024).

- **Households, landlords and compound managers:** Households and landlords decide what type of toilets and containment systems are installed, when they are upgraded, and how they are maintained. Demand for regular desludging is often low in the absence of affordable services, social pressure, or regulation. Behaviour change, targeted subsidies or instalment payment schemes, and transparent pricing are all important to increase uptake of regular, safe emptying (Peal et al., 2014; Mills et al., 2024).

- **Sanitation workers and private emptying providers:** Sanitation workers – both formal and informal – underpin the functioning of urban FSM systems. Small-scale private operators (vacuum truck services, manual emptiers, small firms) are often the primary providers of desludging. Their ability to deliver safely managed services depends on clear operating rules, licensing systems, and access to treatment facilities. In Dakar, Senegal, for example, a franchising model for vacuum truck operators, coupled with investment in faecal sludge treatment, has improved service quality, although challenges remain around illegal dumping and affordability (Dodane et al., 2012). At the same time, many workers operate in hazardous, stigmatised conditions without protective equipment, legal protections, or access to health services.
- **Community-based organisations and frontline workers:** Community groups, health workers and sanitation volunteers often act as intermediaries between households and municipal authorities. They reinforce public health messages, mobilise households during upgrading or desludging campaigns, and may help identify illegal dumping or failing infrastructure. In some cities, community organisations broker or even provide desludging services themselves, helping to bridge the gap between informal settlements and formal service systems.

For Pathway 2 progressive sewer expansion with wastewater treatment plants, the actors can undertake the following systemic interventions.

- **Municipal authorities:** Municipal and metropolitan authorities act as the de facto service authorities for urban sanitation, shaping priorities, approving investments, and enforcing local by-laws. They determine where sewer extensions should be targeted, how land is allocated for wastewater treatment facilities, and whether connection requirements are enforced in newly served areas. A key opportunity is to integrate sewer expansion into wider urban development and to ensure equitable service coverage, particularly in low-income and informal settlements (Yap et al., 2023; Alam et al., 2025a).
- **Utilities:** Water and sewerage utilities are responsible for planning, constructing, and operating sewer networks and wastewater treatment plants. To support the transition to safely managed sanitation, utilities should strengthen their operational and financial foundations, so that they can invest in sustained network expansion. Utilities should also clarify and formalise coordination mechanisms with municipal authorities, so that sewer planning, household connection enforcement, and urban development decisions are aligned. This includes proactively integrating sewer extension with road, housing, and densification projects; enforcing connection requirements once networks are available; and systematically identifying and eliminating illicit discharges.
- **Households and landlords:** Households and landlords play a decisive role in realising safely managed sewer-based sanitation, and they should take proactive steps to connect to available networks, maintain on-plot plumbing, and comply with local regulations governing wastewater disposal. Connection fees can be a significant barrier — so subsidies or instalment options should be used to encourage connection.
- **Sanitation workers, contractors and developers:** Private contractors install household connections, small-bore sewers and sometimes even trunk lines, shaping how networks expand in practice. In the absence of oversight, households may commission informal connections that discharge into storm drains or open channels, bypassing treatment entirely. Utilities and city authorities therefore need to engage and regulate contractors, ensuring they adhere to design standards and connect households correctly to networks.
- **Policy and planning agencies:** National governments and planning bodies define the legal frameworks, investment strategies and technology options for networked sanitation. Their decisions determine whether utilities can finance expansion, whether simplified sewers are recognised as legitimate options, and how equity concerns are addressed. Where policies set ambitious coverage targets but do not address affordability or informal settlements, sewer expansion may reinforce existing spatial inequalities (Tilley et al., 2014; Yap et al., 2023).

Recognising that the progressive realisation of safely managed sanitation in urban areas can follow different pathways, different combinations of measures will be required. Table 8 shows the typical key shifts in the building blocks that can accelerate the overall transition across both pathways.

Table 8: The system interventions per building block to support safely managed sanitation in urban areas

Building block	Systemic interventions
Policy legislation	Establish national and municipal policies that formally recognise the dual pathways for urban sanitation—FSM and sewerage—and set out clear criteria for what constitutes safely managed services across both. Mandate service standards for containment, emptying, transport, treatment, and effluent quality, and ensure that policies require inclusive planning for informal settlements and low-income areas.
Institutions	Define coherent mandates for utilities, municipal authorities, and FSM actors so that responsibilities for networked and non-networked systems are explicit along the entire sanitation chain. Strengthen coordination platforms—such as urban sanitation taskforces or CWIS units—to align planning, budgeting, and enforcement across departments and service providers.
Finance	Develop sustainable O&M financing models for utilities and FSM operators through structured tariffs, cross-subsidies, and predictable municipal budget allocations. Expand targeted financing mechanisms (e.g. connection subsidies, desludging vouchers, blended finance for FSTPs etc.) to unlock household and private sector investment in both sewer and FSM services. Mobilise all levels of government to identify and strategically plan for large capital works to support this transition, such as wastewater and faecal sludge treatment plants, or sewer expansion projects.
Infrastructure	Invest in context-appropriate sanitation infrastructure, combining simplified/condominial sewers, transfer stations, DEWATS, and upgraded septic/containment systems to match urban density and land constraints. Ensure that treatment capacity—centralised or decentralised—keeps pace with network expansion and FSM flows, and design systems for climate resilience and future densification.
Regulation	Enforce standards for containment construction, sewer connections, operator licensing, desludging practices, and treatment performance to reduce public health and environmental risks. Introduce routine compliance monitoring and penalties for illegal dumping, illicit connections, and under-performing treatment plants, supported by transparent public reporting.
Monitoring	Develop monitoring systems that track service performance across both pathways, including connection rates, containment quality, desludging frequency, transport routes, treatment outcomes, and environmental indicators.
Capacity development	Build the technical, managerial, and regulatory capabilities of municipal staff, utilities, FSM operators, and treatment plant personnel through structured training, certification, and mentorship.

6. Conclusions: enabling, accelerating and managing transitions

This paper set out to develop an understanding of the drivers and system implications of a transition from the provision of basic to safely managed water and sanitation services. It analysed the shape of the transition for both water supply and sanitation and set out a series of 13 high-level pathways to move services to safely managed. We also explored the systems interventions that can be taken to enable, accelerate and effectively manage those transitions. In this concluding section, we highlight our key learnings on the pathways for transition. This is followed by conclusions on the drivers for these pathways. We end by proposing a set of principles for supporting the achievement of safely managed water supply and sanitation services.

Pathways to safely managed services

The analysis shows that countries can follow distinct pathways to safely managed services. In Chapter 3, analysing global data, we showed that for water supply, some settings move rapidly, shifting large segments of the population directly to safely managed services and, in doing so, leave persistent gaps in basic access; others appear to consolidate basic services first and then progress to safely managed. The limiting factors for safely managed services also differ by context—whether access on premises, availability when needed, or water free from contamination—and these require specific system interventions to unlock further gains. For sanitation, the global analysis shows patterns are less uniform and the picture is more mixed, with lower data reliability complicating cross-country comparison; nevertheless, when viewed through the technology mix (on-site containment, faecal sludge management, and sewered systems), broad trajectories of change begin to emerge in line with countries' dominant service chains and enabling conditions.

Our analysis then proposes 13 high-level pathways to a safely managed transition. These principles play out along inherent trajectories set by the existing configuration. In water supply, for example, low-density rural areas with extensive household self-supply tend to move either to supported self-supply (risk-based water safety, targeted small grants, simplified testing) or towards piped schemes with household connections as settlements densify and service authorities professionalise operations. In communal rural systems, the shortest route to 'safely managed' is typically household connections plus provider professionalisation, followed by targeted improvements to availability and water quality to close the gap. In (peri-)urban settings, utilities face a two-step ladder: first densify connections (removing up-front fees, regularising connections, extending laterals), then lift service levels through continuity and quality investments.

For sanitation, the trajectories hinge on density, hydrogeology, user demand and state capacity. Rural areas move via on-site containment towards either in situ safe disposal (e.g. twin-pit systems where feasible) or FSM chains (desludging, transport and treatment) as pits age and infill accelerates; where fiscal space and density allow, sewered options (centralised or decentralised/DEWATS) can become part of the mix, even in rural areas. In towns and cities, two complementary routes dominate: professionalised FSM (raising construction standards, licensing emptiers, scheduled desludging, FSTPs/co-treatment) and progressive sewer expansion (prioritising dense areas first, using simplified sewers where appropriate, and aligning household connection policy with treatment capacity).

Drivers of the safely managed transition

These pathways are driven by various groups of actors who are taking systemic interventions.

Household demand shapes the safely managed transition

Our analysis and synthesis of the safely managed transition indicates that demand from users can be one of the key drivers, but this may be limited to certain characteristics of safely managed services. For example, in water supply, user demand is typically strong for moving from public access points towards having water on premises, or moving from a household supply on premises to a connection to a communal water supply. Demand to improve availability and continuity of supply, or water quality is usually less, but may still be a key driver. In sanitation, demand for safe and convenient containment may be high, but similarly

high demand does not extend towards other parts of the sanitation value chain, especially in rural areas.

This makes demand-side measures, such as awareness raising, encouragement, and financial facilitation especially important. Moreover, if that demand comes bit by bit, then service providers and authorities may not be able to respond to that in an effective and efficient way. There may be need for measures to streamline that demand, for example through campaigns for connections to water supply or sewerage networks. In some examples, however, such as related to parts of the sanitation chain beyond containment, governments need to recognise that demand-driven measures may never realise the transition and, instead, governments need to address them directly themselves, including through publicly led or financed interventions.

Service providers stimulating higher levels of service

A second key driver for the transition are service providers themselves. Both in water supply and sewer-based sanitation, especially, service providers often have an interest in connecting as many households as possible, as household contributions form the main source of revenue. And usually that is higher than when it comes from users of point sources. There may also be barriers from the perspective of service providers, including connection fees or negative financial returns from relatively remote household connections. In order to remove these barriers, service providers can take a range of measures, such as payment modalities for connection fees to water supply or sewerage systems, or taking a structured approach to expanding their service areas. Service providers also have a primary responsibility for improving their own operations in terms of continuity and quality of water supply, as well as the safety of their operations along the supply chain. But equally service authorities and national governments may need to take measures to incentivise or regulate service providers to do so.

When it comes to on-site containment with functioning FSM, the importance of market-based service providers grows, especially desludging operators. Evidence indicates that in some urban areas and many rural areas the natural market conditions for an active desludging market are lacking. Government support or input is therefore likely to be especially important, for example through market subsidies or enforcement of scheduled desludging.

Government and service authority interventions: legislative, normative and regulatory measures

A number of system interventions related to legislation, norms and regulations have been identified, particularly by health and environmental authorities. These interventions target either users or service providers:

- Users. The transition from basic to safely services can be accelerated with supportive regulations that include obligations and incentives for households to connect to networked services. In addition, there are also technical norms and standards for household-level facilities, such as septic tanks, but also household wells and boreholes.
- Service providers. Regulatory measures include setting service-level standards or benchmarks and enforcing them. Although that is generally happening for water quality, availability and continuity, there are fewer cases of regulatory measures to encourage utilities to transition from public access points to household connections. Also, regulations for service area demarcation and the relation between utilities and intermediaries and informal service providers are set up. Another set of measures in this domain relates to demarcating service areas and regulating service providers to serve everyone within that area with higher levels of services.

Service authorities and national governments can also take measures in the financial part of the system, again aimed at users and service providers:

- Targeted subsidies or financial incentives for users to improve their household water and sanitation facilities and/or to connect to a communal water or sewerage network, to overcome barriers around connection fees.
- Subsidies and financial support to service providers for capital investments needed to extend their services to remote areas that would otherwise not be financially feasible to serve. Financial support may also be directed at improvements in service performance.

Policy principles for accelerating the transition to safely managed services

The identified drivers and the actions that actors are already taking can be enhanced and accelerated by the authorities in charge of water and sanitation, and those in related sectors, such as (urban) planning. We identify the following conclusions on policy principles that can underpin the acceleration.

Leadership with vision, targets and strategy

- The review of the pathways shows that they all require leadership – whether at national level or locally at city or utility level – to set a vision with clear targets for safely managed services – whether expressed in the form of specific criteria for safely managed or rather in terms of a type of service, e.g. a tap in every house, or a high-performing utility, or a clean city. This leadership then extends into getting the broad buy-in from the various stakeholders. This is often necessary because there may be barriers and vested interests to retain the status quo of basic services. Such a vision needs to be translated into specific targets, which then provide legitimacy and direction to the detailed intervention strategies that can accelerate the transition in a given context.

Use data to understand the transition in a given context

- As we have shown, the transition from basic to safely managed services can take many different pathways and requires multiple criteria to be met; for water: 1) having water on premises, 2) available when needed and 3) being free of priority contamination; and for sanitation: 1) safe containment and disposal in situ, or 2) safety along all steps of the sanitation value chain of collection, transport, treatment and disposal, whether delivered by FSM or sewer-based systems. Because of the multiplicity of factors involved, existing datasets do not give an easy or intuitive insight into the status of the transition. It requires detailed analysis, even of the JMP database, to find out which criteria are met or not in a specific country, or at sub-national level. This is even more difficult when zooming in to specific settings, particularly where different service delivery models co-exist. It therefore requires dedicated and additional effort to collect, disaggregate and analyse data on service levels to inform any strategy for accelerating the transition to safely managed services, and making that transition visible.

Take an area-wide approach

- In practice, multiple types of settings, or service delivery models within a setting, co-exist, and may even overlap. And there are different drivers, some of which may reinforce, or contradict, each other. Although that may appear chaotic or disorganised, it also provides opportunities to apply multiple strategies to transition a whole area to safely managed services. For example, a utility may not only promote household connections within its network area, but it may also extend its services to surrounding rural areas and provide higher levels of service there. Taking an areas-based approach means a range of measures can be taken by the various actors within the area; and these measures can be coordinated and aligned in a strategic measure.

Final word

We believe that the concepts and frameworks presented in this paper can support actors in purposively supporting the basic to safely managed transition. This involves identifying the status quo and trends in service levels and identifying the multiple possible and feasible pathways to move towards safely managed services, in a given context. The synthesis of experiences then provides examples and insights of what different actors can do to support that transition and, by implication, how sector strategies can be designed to accelerate that transition. Ultimately, this provides a framework for identifying and prioritising the system interventions that can help support the safely managed service transition.

However, we recognise that the pathways through which this transition unfolds will vary subtly across contexts and will continue to evolve as technologies, financing flows, and institutional arrangements change. We therefore encourage continued interrogation, adaptation, and sharing of these pathways to strengthen collective learning and sector-wide progress.

7. References

Acey, C., Kisiangani, J., Ronoh, P., Delaire, C., Makena, E., Norman, G., Levine, D., Khush, R., and Peletz, R. (2019). Cross-subsidies for improved sanitation in low income settlements: Assessing the willingness to pay of water utility customers in Kenyan cities. World Development, 115, 160–177. **https://doi.org/10.1016/J.WORLDDEV.2018.11.006**

Adank, M., Lieshout, R.V. and Ward, R., (2021). Utility-managed rural water services: models, pathways, drivers, performance and areas for support. Thematic Overview Paper. IRC: The Hague, the Netherlands. **https://www.ircwash.org/sites/default/files/084-202109top_utilitymanagedruralwaterservices03.pdf**

Akinbode, A. (2010). Urban water supply in Lagos: Challenges and opportunities. Journal of Sustainable Development in Africa, 12(4), 1–15

Alam, M. U., Rahat, M. A., Neeher, N., Tabassum, K. F., Nawaz, S., Evans, B., and Hutchings, P. (2025). Barriers to sewer connection in urban Dhaka: Individual and organisational challenges. Journal of Water, Sanitation and Hygiene for Development, 15(4), 287–304. **https://doi.org/10.2166/WASHDEV.2025.281**

Alam, M. U., Rahat, M. A., Nawaz, S., Neeher, N., Tabassum, K. F., Upoma, T. A., Kamal, A., Evans, B., and Hutchings, P. (2025). Behaviour change interventions to promote household connectivity to sewer: a scoping review. Global Health Action, 18(1). **https://doi.org/10.1080/16549716.2025.2476335**

Alvarez, L. (2019). Access to water and sanitation services in dispersed rural settlements: The path to universalization. Technical Note TN-01729. Washington DC: Inter-American Development Bank. **http://dx.doi.org/10.18235/0001885**

Alvarez, L., Vargas, L. and Jimenez, A. (2024). Priorities for the rural water and sanitation services regulation in Latin America. Frontiers in Water, 6, p.1406301. Available from: Frontiers | Priorities for the rural water and sanitation services regulation in Latin America. **https://doi.org/10.3389/frwa.2024.1406301**

Ampadu-Boakye, J., Cuscuna, L. and Yeboah, C. (2021). Accelerating Progress Toward Financial Sustainability. **https://safewaternetwork.org/knowledge-hub/accelerating-progress-toward-financial-sustainability/**

Balasubramanya S, Evans B, Hardy R, Ahmed R, Habib A, Asad NSM, et al. (2017) Towards sustainable sanitation management: Establishing the costs and willingness to pay for emptying and transporting sludge in rural districts with high rates of access to latrines. PLoS ONE 12(3): e0171735. **https://doi.org/10.1371/journal.pone.0171735**

Boakye-Ansah, A., Schwartz, K. and Zwarteveen, M. (2019a). From Rowdy Cartels to Organized Ones? The Transfer of Power in Urban Water Supply in Kenya. In: The European Journal of Development Research 31:1246–1262. **https://link.springer.com/article/10.1057/s41287-019-00209-3**

Boakye-Ansah, A., Schwartz, K. and Zwarteveen, M. (2019b). Unravelling pro-poor water services: what does it mean and why is it so popular? In: Journal of Water, Sanitation and Hygiene for Development 9 (2): 187–197. **https://doi.org/10.2166/washdev.2019.086**

Bower, M. (2021). The role of self-supply in Scotland. In: Sutton, S., and J. Butterworth. 2021. 'Self-Supply: Filling the gaps in public water supply provision. Practical Action publishing, IRC: The Hague, The Netherlands. **https://practicalactionpublishing.com/book/2530/self-supply**

Cardoso Castro, P.P., Vachkova, M., Ravena N. and Veloso, N. (2024). The One Million Cisterns Programme—a viability assessment of community rainwater management in Brazil. In: Frontiers in Sustainability. 5-2024. **https://doi.org/10.3389/frsus.2024.1401440**

Carter, R. (2021). Rural Community Water Supply. Practical Action Publishing Ltd. **https://practicalactionpublishing.com/book/2556/rural-community-water-supply**

Dasgupta, S., and Agarwal, N. (2022). Dichotomy to Continuum: Importance of Faecal Sludge Management in Shaping Future Urban–Rural Linkages in Urbanizing India. Environment and Urbanization ASIA, 13(1), 168–178. **https://doi.org/10.1177/09754253221083199**

Dodane, P. H., Mbéguéré, M., Sow, O., and Strande, L. (2012). Capital and operating costs of full-scale fecal sludge management and wastewater treatment systems in Dakar, Senegal. Environmental Science and Technology, 46(7), 3705–3711. **https://pubs.acs.org/doi/10.1021/es2045234**

Federal Ministry of Water Resources. (2022). Nigeria Water Sanitation and Hygiene. Sector Finance Advocacy Strategy and Plan. **https://clearinghouse.unicef.org/download-ch-media/d2955c51-e3cc-44dc-9008-195756a78354**

Franceys, R. and E. Gerlach (eds.). (2006). Charging to enter the water shop? Centre for Water Science, Cranfield

University. **https://assets.publishing.service.gov.uk/media/57a08c3b40f0b652dd0011ce/R8319-DisseminationReport.pdf**

Franceys, R. and Hutchings, P. (2026). The role of Container-Based Sanitation in achieving Safely Managed Sanitation in an English Rural District, 1900 – 1975. Journal of Water, Sanitation and Hygiene for Development. (Accepted).

Gambrill, M., Gilsdorf, R. J., and Kotwal, N. (2020). Citywide Inclusive Sanitation—Business as Unusual: Shifting the Paradigm by Shifting Minds. Frontiers in Environmental Science, 7, **https://doi.org/10.3389/fenvs.2019.00201**

General Economics Division (2020). Revised Monitoring and Evaluation Framework of the Sustainable Development Goals (SDGs): Bangladesh Perspective. Bangladesh Planning commission, Ministry of Planning, Government of the People's republic of Bangladesh. **https://gedkp.gov.bd/wp-content/uploads/2021/02/Revised-Monitoring-and-Evaluation-Framework-of-the-Sustainable-Development-Goals-SDGs-Bangladesh-Perspective.pdf?post_id=654**

IRC and Water For People (2021). Destination 2030. **https://www.ircwash.org/resources/destination-2030-long-term-vision-and-10-year-strategy**

Jal Jeevan Mission. (2021). Reforms in Rural Drinking Water Supply (Decentralized, demand-driven, community-managed water supply programme). **https://jaljeevanmission.gov.in/sites/default/files/manual_document/JJM-Reform-Document-English.pdf**

Laukka, V., Kallio, J., Herrmann, I., Malila, R., Nilivaara, R. And Heiderscheidt, E. (2022). Governance of on-site sanitation in Finland, Sweden and Norway. SYKE Finnish Environment Institute. Helsinki, Finland. **http://hdl.handle.net/10138/340576**

Lockwood, H. and Smits, S. (2011). Supporting Rural Water Supply: Moving Towards a Service Delivery Approach. Practical Action Publishing Ltd. **https://www.ircwash.org/sites/default/files/Lockwood-2011-Supporting.pdf**

Lyu, X., Wang, Z., Wachenheim, C., and Zheng, S. (2025). Are Rural Residents Willing to Pay for Sanitation Improvements? Evidence from China's Toilet Revolution. Agriculture 2025,Vol. 15, Page 821, 15(8), 821. **https://doi.org/10.3390/AGRICULTURE15080821**

Maxcy-Brown, J., Capone, D., and Elliott, M. A. (2023). Characterizing the nature and extent of access to unsafely managed sanitation in the United States. Nature Water, 1(11), 915–928. **https://www.nature.com/articles/s44221-023-00157-7**

Mills, F., Foster, T., Kome, A., Munankami, R., Halcrow, G., Ndungu, A., Evans, B., and Willetts, J. (2024). Indicators to complement global monitoring of safely managed on-site sanitation to understand health risks. Npj Clean Water, 7(1), 1–14. **https://www.nature.com/articles/s41545-024-00353-2**

Ministry of Finance and Planning. (2021). National Five Year Development Plan 2021/22 - 2025/26. The United Republic of Tanzania. **https://tanzaniagoaltrack.nbs.go.tz/content/platform/tanzania/five-year-plan.pdf**

Ministry of Water and Sanitation. (2023). National Water Policy. Government of Malawi. **https://www.water.gov.mw/index.php/ar/downloads/policy-documents?download=24:revised-national-water-policy-28-january-2022**

Morgan. P. (2021). The National Upgraded Well Programme, Zimbabwe. In: Sutton, S., and J. Butterworth. (2021). 'Self-Supply: Filling the gaps in public water supply provision. Practical Action publishing, IRC: The Hague, The Netherlands. **https://practicalactionpublishing.com/book/2530/self-supply**

National Planning committee. (2020). Malawi 2063. Malawi's Vision, An Inclusively Wealthy and Self-reliant Nation. **https://www.undp.org/sites/g/files/zskgke326/files/2022-06/MW2063-VISION-FINAL.pdf**

Peal, A., Evans, B., Blackett, I., Hawkins, P., and Heymans, C. (2014). Fecal sludge management: a comparative analysis of 12 cities. Journal of Water, Sanitation and Hygiene for Development, 4(4), 563–575. **https://doi.org/10.2166/WASHDEV.2014.026**

Rickert, B. Samwell, M., Shinee, E., Kožíšek, F. and Schmoll, O. (2016). Status of small-scale water supplies in the WHO European Region. WHO and UNECE. **https://www.who.int/europe/publications/i/item/9789289051941**

Rickert, B., Barrenberg E. and Schmoll, O. (2016). Taking policy action to improve small-scale water supply and sanitation systems; Tools and good practices from the pan-European region. WHO and UNECE. **https://www.who.int/europe/publications/i/item/9789289051606**

Saladin, M. (2021). The shining example of domestic rainwater harvesting in Thailand. In: Sutton, S., and J. Butterworth. 2021. 'Self-Supply: Filling the gaps in public water supply provision. Practical Action publishing, IRC: The Hague, The Netherlands. **https://practicalactionpublishing.com/book/2530/self-supply**

Smets, S. (2021). Self-supply in the Danube region. In: Sutton, S., and J. Butterworth. (2021). 'Self-Supply Filling the gaps in public water supply provision. Practical Action publishing, IRC: The Hague, The Netherlands. **https://practica-**

lactionpublishing.com/book/2530/self-supply

Smits, S. and Mekonta, L. (2023). Payment modalities for low-income households. RVO, The Hague: the Netherlands. **https://english.rvo.nl/sites/default/files/2023-08/FDW%20Payment%20modalities%20for%20low-income%20households%202023%20-%20June%202023.pdf**

Smits, S. and Sutton, S. (2012). Self Supply: The case for leveraging greater household investment in water supply. IRC: The Hague, The Netherlands. **https://es.ircwash.org/sites/default/files/Smits-2012-Self.pdf**

Soppe, G., Janson, N. and Piantini, S. (2018). Water Utility Turnaround Framework; A Guide for Improving Performance. World Bank Group, Washington, DC. **https://documents1.worldbank.org/curated/en/515931542315166330/pdf/Water-Utility-Turnaround-Framework-A-Guide-for-Improving-Performance.pdf**

Sutton, S., and Butterworth, J. (2021). 'Self-Supply: Filling the gaps in public water supply provision. Practical Action publishing, IRC: The Hague, The Netherlands. **https://practicalactionpublishing.com/book/2530/self-supply**

Sylvester, R. E., Chiwanda, E., Bartram, J., Dreibelbis, R., Smits, S., Hutchings, P., and D'Mello-Guyett, L. (2026). Water, sanitation and hygiene (WASH) system strengthening in low- and middle-income countries (LMICs): a systematic review on the state of the evidence. Research Square [Preprint]. **https://doi.org/10.21203/RS.3.RS-9292414/V1**

Tilley, E., Ulrich, L., Lüthi, C., Reymond, P., and Zurbrügg, C. (2014). Compendium of Sanitation Systems and Technologies 2nd revised edition. EAWAG, Switzerland. **https://www.eawag.ch/fileadmin/Domain1/Abteilungen/sandec/schwerpunkte/sesp/CLUES/Compendium_2nd_pdfs/Compendium_2nd_Ed_Lowres_1p.pdf**

Tomoi, H., MacLeod, C., Moriyasu, T., Simiyu, S., Ross, I., Cumming, O., and Braun, L. (2024). Determinants of Willingness to Pay for Fecal Sludge Management Services and Knowledge Gaps: A Scoping Review. Environmental Science and Technology, 58(4), 1908–1920 **https://pubs.acs.org/doi/10.1021/acs.est.3c06628**

Truelove, Y. (2019). Infrastructural fragmentation in Dar es Salaam: The politics of water access on the urban fringe. Environment and Planning E: Nature and Space, 2(4), 916–938

UNICEF (2022). The UNICEF Game Plan to Reach Safely Managed Sanitation 2022–2030. **https://www.unicef.org/documents/sanitation-game-plan**

UN Water (2020). The Sustainable Development Goal 6 Global Acceleration Framework. **https://unsceb.org/sites/default/files/2021-06/Global-Acceleration-Framework.pdf**

USAID (2024). Business Models for Rural Fecal Sludge Management: A Desk Review. **https://hdl.handle.net/10779/ids.29100317**

Water and Sanitation Corporation (WASAC) Ltd. (2022). Development of Rwanda National Integrated Water Supply and Sanitation Master Plans (RNIWSSMP). Phase III – Master Plan Volume 1 – Water Supply (Final Version). Government of Rwanda

WHO/UNICEF (2018). JMP methodology; 2017 update and SDG baselines. **https://washdata.org/reports/jmp-2017-methodology**

WHO/UNICEF (2025). JMP database. **https://washdata.org/**

WHO (2024) Guidelines for drinking water quality: small water supplies. World Health Organization. **https://www.who.int/publications/i/item/9789240088740**

Wolf, J., Johnston, R. B., Ambelu, A., Arnold, B. F., Bain, R.,Brauer, M., Brown, J., Caruso, B. A., Clasen, T., Colford, J.M., Mills, J. E., Evans, B., Freeman, M. C., Gordon, B., Kang, G., Lanata, C. F., Medlicott, K. O., Prüss-Ustün, A., Troeger, C., Cumming, O. (2023). Burden of disease attributable to unsafe drinking water, sanitation, and hygiene in domestic settings: a global analysis for selected adverse health outcomes. The Lancet, 401(10393), 2060–2071. **https://doi.org/10.1016/S0140-6736(23)00458-0**

Yap, C., Mcfarlane, C., Ndezi, T., and Makoba, F. D. (2023). Sanitation challenges in Dar es Salaam: the potential of Simplified Sewerage Systems. Environment and Urbanization,35(1), 12–29 **https://journals.sagepub.com/doi/10.1177/09562478221146722**

IRC
Supporting water sanitation and hygiene services for life

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

UNIVERSITY OF LEEDS

UK International Development
Partnership | Progress | Prosperity