USAID Water for the World

Implementation Research Agenda
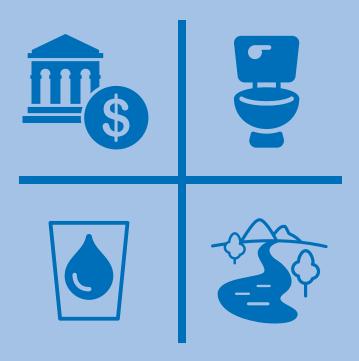
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ACRONYMS

CBM	Community-Based Management
CLTS	Community-Led Total Sanitation
ICT	Information and Communications Technologies
IWRM	Integrated Water Resources Management
FSM	Fecal Sludge Management
GWS	Global Water Strategy
MBS	Market-Based Sanitation
MHM	Menstrual Hygiene Management
MSI	Management Systems International
NGO	Non-Governmental Organization
SDG	Sustainable Development Goal
SIP	Small and Informal Providers
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
UNICEF	United Nations Children's Fund
U.S.	United States
USAID	United States Agency for International Development
USG	United States Government
WRM	Water Resources Management

INTRODUCTION

Water and sanitation issues are among the most pressing global concerns of the next decade, with more than 2 billion people still living without access to safe water, even more living without hygienic sanitation, and water scarcity increasingly affecting some of the world's most vulnerable populations. Water and sanitation underpin the wellbeing, household assets, and livelihoods of vulnerable communities the world over, providing a critical foundation for meaningful progress along the humanitarian to development continuum—including in the face of COVID-19.

To underscore the importance of this critical issue and marshal a whole-of-government response, the U.S. Government issued the inaugural Global Water Strategy (GWS) in 2017 that envisions a water-secure world, where people and nations have the water they need to be healthy, prosperous, and resilient. The United States Agency for International Development's USAID's Water and Development Plan provides a strategic overview of the Agency's intended contribution to the GWS and seeks to increase the availability and sustainable management of safe water and sanitation for the underserved and most vulnerable. In its plan, USAID commits to provide 15 million people with sustainable access to safe drinking water services and 8 million people with sustainable access to sanitation services by 2022. To meet these targets, ensure effective programming with taxpayer dollars, and help inform the next Global Water Strategy in 2022, USAID is launching its first sector research agenda with the intention of expanding the evidence base about what works in water and sanitation programming and under what conditions.

Purpose

The evidence base for effective water security, sanitation, and hygiene programming continues to improve. However, there are many evidence and knowledge gaps that hinder the ability of the sector to expand and sustain water, sanitation, and hygiene (WASH) services and improve water resources management (WRM). Indeed, while many of the benefits of access to water and sanitation services are well established,[1] the sector is off track to meet global access targets.[2] This agenda aims to direct resources toward actionable research that supports the design and implementation of effective water security, sanitation, and hygiene development programming, to expand the evidence base for implementation and accelerate progress toward a water-secure world.

Research aligned with this agenda will also reinforce the Agency's impact in other sectors and can help to build the evidence base for enhanced linkages between emergency programming and sustainable water and sanitation service delivery. For example, some water, sanitation, and hygiene implementation research gaps identified here are important to the USAID Multi-Sectoral Nutrition Strategy and the U.S. Global Food Security Strategy, as well as to focal areas in the USAID Environment and Natural Resources Framework. In addition, filling some evidence gaps around effective water, sanitation, and hygiene programming will promote education outcomes outlined in the U.S. Government Strategy on International Basic Education. Thus, research aligned with this agenda promotes mutually reinforcing relationships across USAID strategies and the research agendas they have inspired.

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[1] WHO. 2016. Sanitation Fact Sheet; Lixil, WaterAid Japan, and Oxford Economics. 2016. The True Cost of Poor Sanitation; UNICEF. 2016. Collecting Water is Often a Colossal Waste of Time for Women and Girls.

[2] UNICEF and WHO. 2019. Progress on Drinking Water, Sanitation, and Hygiene Special Focus on Inequalities. New York.

We developed the agenda to coordinate, integrate, and inspire the implementation of sector research. Thus, the agenda will be used as a guide for existing USAID sector research activities, new research activities, and for embedding implementation research in relevant bilateral and regional USAID mission programming. Toward that end, we hope this agenda can help to enhance efficiencies, avoid duplication of effort, and maximize potential uptake of findings from both Headquarters and Mission programming. We also hope this agenda can serve as a guide for evidence generation across the broader sector, catalyzing and focusing others' investments, and ultimately helping to drive improvements in the effectiveness of water security, sanitation, and hygiene programming writ large.

The Role of Research on the Impacts of WASH Services

USAID believes that water and sanitation have intrinsic value, and there is an abundance of evidence justifying our vision for a water-secure world.[3] This is further described in the GWS, USAID Agency Plan, and in the *2014 Senator Paul Simon Water for the World Act*. However, further study of the impacts of access to WASH and improved WRM on health, economic growth, and other development outcomes is still important, especially as it relates to understanding outcomes beyond improved health.[4]

Although research and analytics on the impacts of access to WASH are not the focus of this agenda given the Agency's interest in immediate application to programming, we note a number of areas of inquiry related to the downstream effects from WASH and WRM improvements that surfaced during the course of consultations for this agenda.

These areas of inquiry include clarifying the impact of WASH services on government effectiveness, human rights, equitable economic growth, early childhood development and human capital, mental and social well-being, global health security, mitigating state fragility, and resilience to environmental risks. We list these here not as output from a systematic process, but as a signal for donors, funders of basic research, and the research community considering areas for future impact research. USAID may separately consider investments in answering questions about broader impacts, which are likely to result from accomplishing our Development Results.

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[3] WHO. 2016. Sanitation Fact Sheet. Lixil, WaterAid Japan, and Oxford Economics. 2016. The True Cost of Poor Sanitation. Tokyo, Japan: Lixil; UNICEF. 2016. Collecting Water is Often a Colossal Waste of Time for Women and Girls. Press release, New York/Stockholm.

[4] Andres, L.A., Borja-Vega, C., Fenwick, C., De Jesus Filho, J., and R.E. Gomez Suarez. 2018. *Overview and Meta-Analysis of Global Water, Sanitation, and Hygiene (WASH) Impact Evaluations (English)*. Policy Research working paper; no. WPS 8444. Washington, D.C.: World Bank Group

IMPLEMENTATION RESEARCH AGENDA PRINCIPLES & METHODOLOGY

As a first step to developing the agenda, USAID set the following high-level principles:

1. **Relevance to USAID programming**. We sought to identify and prioritize evidence gaps and research questions that address real-world implementation challenges that are regularly encountered by USAID Missions and implementing partners.

2. **Potential for sector-wide impact.** We also sought to prioritize based on what evidence has the potential for the greatest benefit for increasing WASH access and sustainability more broadly across the sector.

3. **Leverage collaboration**. We aimed to maximize input and collaboration with other development partners, national governments, and implementing organizations to ensure relevance, and to encourage others to join USAID in addressing priority knowledge gaps.

These principles guided the development of this agenda across four main stages, which are described in more detail below: 1) identifying and narrowing the technical scope; 2) prioritizing key programming approaches for investigation; 3) identifying evidence gaps within the scope; and 4) vetting, validating, and prioritizing evidence gaps and associated research questions (Figure 1).

IDENTIFY SCOPE
Define programming approaches and interventions

PRIORITIZE
Select key programming approaches

EXPLORE
Review evidence base for key programming approaches and identify evidence gaps

VALIDATE & PRIORITIZE
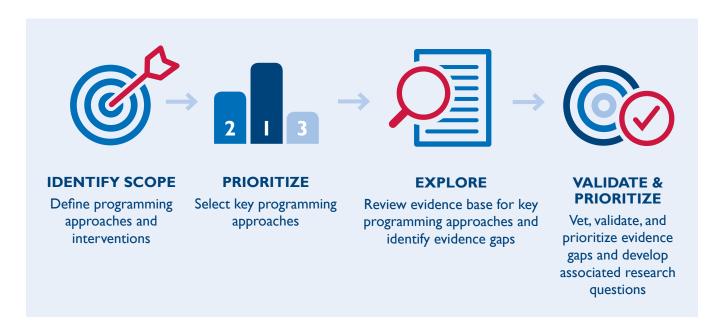Vet, validate, and prioritize evidence gaps and develop associated research questions

FIGURE 1: THE FOUR MAIN STAGES OF DEVELOPING THE USAID WATER FOR THE WORLD IMPLEMENTATION RESEARCH AGENDA

STAGE 1 – Identify Scope

Defining a scope was the first step in our process. We used the USAID Water and Development Plan Results Framework, including its overall goal and its four contributing Development Results (Figure 2), as the broad bounds of the technical scope for the agenda. While important, we excluded from the scope complementary results identified in the Results Framework. In some instances, these result areas are the subject of their own standalone research or learning agendas, as is the case with irrigation, ecosystems, education, and emergency WASH.[5]

To further narrow the scope to be the most relevant to current agency WASH programming, we next developed an inventory of the programmatic approaches that contribute to each Development Result of the Water and Development Plan, and identified the most common approaches to implementing against the plan. To develop the inventory, we conducted a review of USAID-funded activities in Water for the World High Priority and Aligned water countries (largely via Globalwaters.org and Climatelinks.org), as well as a survey of water and sanitation experts within the Agency. We also selectively consulted current implementing partners to help identify key programmatic approaches. Based on these findings, we catalogued prevalent approaches and associated programmatic interventions in practice across USAID's global water security, sanitation, and hygiene portfolio.

USAID GOAL

To increase the availability and sustainable management of safe water and sanitation for the underserved and most vulnerable, in alignment with U.S. national security and foreign policy objectives.

DEVELOPMENT RESULTS

DEVELOPMENT RESULT 1

STRENGTHENING SECTOR GOVERNANCE & FINANCING

DEVELOPMENT RESULT 2	DEVELOPMENT RESULT 3	DEVELOPMENT RESULT 4
INCREASE SUSTAINABLE ACCESS & USE OF SANITATION & THE PRACTICE OF KEY HYGIENE BEHAVIORS	INCREASE SUSTAINABLE ACCESS TO SAFE DRINKING WATER	IMPROVE MANAGEMENT OF WATER RESOURCES

FIGURE 2: USAID WATER AND DEVELOPMENT PLAN RESULTS FRAMEWORK

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[5] Stevens, C. et al. 2020. Land and Development: A Research Agenda for Land and Resource Governance at USAID; USAID Land Office; USAID. 2019 Self-Reliance Learning Agenda; Feed the Future. 2018. Feed the Future Learning Agenda; USAID. 2015. Biodiversity and Development Research Agenda. USAID Office of Forestry and Biodiversity. 2015.

STAGE 2 – Prioritize Programming Approaches

Generating evidence summaries to support every programmatic approach would be ideal, however, we recognized the need to further narrow the technical scope of the agenda to balance relevancy and thoroughness with the level of effort required. As a result, we prioritized programmatic approaches before diving into the evidence base so that we could ensure that thorough evidence summaries were generated for the most prevalent and important approaches. To determine which programmatic approaches were the most critical to include, we:

1. Conducted an extensive survey across the Agency both in Washington and in Missions asking for expert opinions on the prevalence and importance of approaches in field programming.

2. Conducted consultations with implementing partners to triangulate the frequency of applied approaches in field programs.

3. Selected the top programmatic approaches per Development Result.

4. Validated the results through consultation with USAID Washington-based water, sanitation, and hygiene advisors.

Figure 3 shows the list of prioritized programming approaches selected through this process.

DR 1 **Governance and finance**	DR 2 **Sanitation and Hygiene**	DR 3 **Drinking Water**	DR 4 **Water Resources Management**
• Strengthen regulatory frameworks and implementation • Collective action for improved governance • Increased domestic resource mobilization • Increased commercial finance	• Sanitation demand generation • Market-based sanitation (MBS) • Fecal sludge management (FSM) • Improve hygienic environments • Hygiene promotion • Menstrual hygiene management	• Improve performance of community-managed water supply systems • Improve performance of urban water utilities • Improve management of water quality	• Implement water resources management planning • Protect and rehabilitate watersheds

FIGURE 3: LIST OF PRIORITIZED PROGRAMMING APPROACHES USED TO GUIDE EVIDENCE SUMMARIES COMMISSIONED AS A STEP IN DEVELOPING THE IMPLEMENTATION RESEARCH AGENDA.

STAGE 3 – Explore the Evidence Base

Next, USAID commissioned a series of evidence summaries for prioritized programmatic approaches. The commissioned reviews synthesized the evidence base for each selected programmatic approach, relying primarily on literature reviews that incorporated recent metanalysis, evaluation syntheses, systematic reviews, and primary studies. Key informant interviews with approximately 20 external water and sanitation experts from academia, think tanks, the private sector, nonprofits, and bi- and multilateral donor agencies (four to five key informants per Development Result) also helped identify relevant evidence and evidence gaps, supplementing the literature review. We combined the commissioned literature reviews and interviews,[6] along with similar analyses conducted under other USAID sector research mechanisms,[7] to form the universe of potential implementation evidence gaps reviewed for inclusion in the agenda.

STAGE 4 – Validate and Prioritize Evidence Gaps

In the final stage, we validated and prioritized the evidence gaps resulting from the literature reviews and evidence summaries. Consultants first prioritized evidence gaps identified during the previous stage by using a scoring rubric with four key criteria: 1) global strategic value; 2) emerging area of interest; 3) cross-cutting benefit; and 4) operations-focused.[8]

We conducted several additional activities to validate and to further prioritize evidence gaps and associated research questions, including: 1) producing executive summaries of each commissioned evidence report highlighting key evidence gaps;[9] 2) validating evidence gaps through a series of consultations with DC-based Agency WASH advisors; 3) leading an internal validation and prioritization workshop with USAID's Mission WASH Leads; 4) holding a closed-door meeting with key sector donors on the margins of the 2019 Stockholm International Water Institute World Water Week; 5) issuing an internal Agency survey that solicited input from across operating units; 6) convening a workshop at the 2019 University of North Carolina Water and Health Conference to get input from external researchers and implementers in the sector; and 7) revalidating prioritization results and selected priority research areas through a final round of internal USAID consultations. We drew from these inputs to select and refine two to three research questions per programmatic approach for inclusion in the final agenda.

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[6] Management Systems International (MSI) developed an "Evidence Gaps Analysis for the USAID Water and Development Research Agenda" for each Development Result. The analyses are available on Development Experience Clearinghouse.

[7] Additional recent USAID analyses were drawn from to supplement evidence summaries commissioned as part of the development of this research agenda. The following analyses provided evidence summaries on the programmatic approaches including Sanitation Demand Generation, Market-Based Sanitation, Menstrual Hygiene Management, Improve Hygienic Environments, and Collective Action for Improved Governance: USAID: An Examination of CLTS's Contributions Toward Universal Sanitation (2018); USAID "Toward a Hygienic Environment for Infants and Young Children: A Review of the Literature" (2018); USAID "Scaling Market-Based Sanitation: Desk Review on Market-Based Rural Sanitation Development Programs" (2018); USAID Information and Communication Technology for Community-Led Total Sanitation (CLTS): A Landscape Assessment (2018).

[8] The "global strategic value" criteria relates to an evidence gap's global applicability—i.e., whether it is prevalent across diverse political/cultural contexts, geographies, or ecosystems—to ensure that USAID-funded water and sanitation research generates knowledge of benefit within and beyond the countries where USAID works. The criteria for an "emerging area of interest" reflects the importance of generating evidence to support new and promising approaches in the sector. These approaches are not as widely applied across USAID's water and sanitation portfolio, but are areas of growing interest that have potential to address water and sanitation challenges in new ways. The "cross-cutting benefits" criteria relates to the desire to prioritize research that might contribute to the achievement of multiple Water and Development Plan DRs. The "operations-focused" criteria was intended to help us prioritize implementation research that addresses key programming knowledge gaps at USAID Missions.

[9] Executive summaries of each MSI evidence gap analysis are available upon request.

PRIORITY RESEARCH QUESTIONS

Evidence gaps and key research questions developed as outputs of the aforementioned process are presented below under the relevant programmatic approaches within each USAID Water and Development Plan Development Result.[10] The research questions are phrased in a necessarily broad way, in order to capture an overall gap in knowledge, and to ensure that they are relevant across the many contexts in which USAID operates. They are particularly broad where the evidence base is weak and multiple streams of work will be required to develop a better knowledge base to guide implementation. Future work will likely be necessary in some cases to narrow research questions so that they are more actionable for designing studies. We also envision that multiple studies, across different contexts, will be required to fill many of the research gaps. As USAID alone is unlikely to fully answer all of these questions, we will look to partner with others in the sector with similar goals to close critical evidence gaps and advance sector programming (see also "Approaches for Implementing Against the Research Agenda" on page 25).

DEVELOPMENT RESULT 1: STRENGTHEN SECTOR GOVERNANCE AND FINANCING

USAID seeks to improve sector finance and governance by strengthening responsible local and national institutions and policies, which will be critical to enable countries to transition away from reliance on foreign assistance. USAID recognizes that it is not enough to only target government systems in the water and sanitation sector. A range of actors, including the private sector, civil society, water and sanitation users, water and sanitation service providers—and the institutions that represent them—need to be engaged to improve accountability, advocacy, and citizen demand for improved services and better WRM.

Institutional strengthening in the sector can also serve as an entry point to improved overall governance, especially where there are cross-cutting challenges, such as corruption or weak institutions. Improved provision of basic services, such as drinking water and sanitation, is a critical component of building government effectiveness,[11] as these services contribute to improving the legitimacy and accountability of governments with their citizens.[12]

Increasing finance and improving governance for drinking water, sanitation, and WRM are inextricably linked. When countries have effective policies, country-led processes, and institutions capable of implementing these policies and processes, they attract investment from both domestic and external sources, leading to a virtuous cycle of increased capacity, greater investor confidence, increased sector finance, and accelerated coverage of water and sanitation services. USAID seeks improvements in finance and governance by strengthening policies and institutions with the overall aim of supporting countries along their journey to self-reliance.

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[10] Note that in some cases, the agenda consultation and validation process led to slight changes in the wording of programmatic approaches, compared to those shown in Figure 3, which correspond to approaches initially identified early in the process.

[11] Accordingly, water and sanitation access is an input to the "Government Effectiveness" criteria in the USAID Journey to Self-Reliance scorecard methodology.

[12] Plummer J. and T. Slaymaker. 2007. Rethinking Governance in Water Services. Overseas Development Institute.

APPROACH 1.1: Develop and Strengthen Regulatory Frameworks

Since the early 1990s, more than 30 countries have established WASH regulators, and others have expanded the jurisdiction of existing regulators (e.g., energy) to include WASH. Most of these bodies are responsible for tariff regulation, monitoring operational and financial performance, and setting incentives for efficient investment. However, water and sanitation regulation lags behind other infrastructure regulation (e.g., telecommunications, transport, energy), and information that is available is dominated by analyses of urban water supply regulation, mainly in the context of public-private partnerships. WASH regulations to address rural water and sanitation service arrangements, informal providers, housing, and services to the poor are largely neglected.

RESEARCH QUESTION 1.1.1

> *What are the best approaches to regulate small and informal service providers? How can this be done without disrupting the service they often provide to the poorest and most vulnerable?*

In developing countries, small and informal providers (SIP) play a vital role in extending water and sanitation coverage to segments of the population not connected to the main utility networks. For example, private and/or informal providers of bottled water, tankers, and pit-emptying services are prevalent in many contexts. However, SIPs are often not officially recognized or regulated and can operate outside water quality standards, which may pose public health risks. Recent research suggests that bringing SIPs into the regulatory fold would allow for regular oversight that could dramatically improve quality and services.[13] More evidence is needed to understand what it would take to incorporate SIPs into a country's WASH regulatory framework, including potential legal and institutional changes.

It is important to better understand the costs and benefits of regulation and support to SIPs, as these providers play an important role in delivering services in many contexts. SIPs often provide services to the poorest and most vulnerable, so it is critical that regulation does not have unintended negative effects on these populations.[14] Therefore, a key component of addressing this question will be to better understand how to regulate SIPs so that they can continue to help expand services to the poorest and most vulnerable people.

RESEARCH QUESTION 1.1.2

> *How can enabling factors and other conditions be modified to influence implementation of water quality and sanitation policies, regulations, and processes?*

Many countries have standards for drinking water quality. WHO provides detailed scientific standards and guidelines for implementation with which countries can align.[15] However, there is limited evidence on the degree to which countries follow these guidelines and enforce regulations. The monitoring and enforcement of water quality regulation is influenced by many factors beyond the formal policies and institutions in place. Understanding the regulatory incentives used to motivate actors and the coherence of these within the broader political context of the sector is critical to influencing water quality regulation. Because political contexts vary widely, multi-country studies are needed to assess enabling factors, local context, and culturally sensitive conditions that influence the development and implementation of water quality regulations, policies, and standards.

[13] Trémolet, S. and J. Halpern. 2006. Regulation of Water and Sanitation Services: Getting Better Service to Poor People. Output-Based Aid Working Paper, 8. Washington, DC: World Bank

[14] Trémolet, S. and C. Hunt. 2006. Taking Account of the Poor in Water Sector Regulation. Water and Sanitation Program Working Note, no. 11. Washington, DC: World Bank.

[15] WHO. 2018. Developing Drinking-Water Quality Regulations and Standards: General Guidance with a Special Focus on Countries with Limited Resources.

In contrast to water quality regulations, the regulation of sanitation is often neglected even at the level of having formal regulations passed. Many countries still lack explicit policies, minimum standards, roles, or compliance mechanisms; this is at least partially because responsibility for sanitation is often split between multiple ministries.[16] It is critical to develop a knowledge base on how countries have (or have not) incorporated sanitation standards into their legal and regulatory environments, and to what effect. Evidence is also needed on the key constraints and challenges to implement sanitation regulations, along with data on associated costs.

RESEARCH QUESTION 1.1.3

How have different modalities of providing technical assistance been used to influence the design and implementation of WASH policies and regulations? Under what conditions have these been most effective?

Many development partners are investing significantly in providing technical assistance related to WASH policies and building WASH regulatory capacity, and USAID encourages activities to incorporate appropriate governance interventions. This technical assistance takes many forms including formal training, mentoring, twinning, and other methods. However, information on the scope and effectiveness of such interventions is not easily available. Capacity building and sector reform are not linear processes and rely on incorporating a high degree of learning. A more comprehensive analysis of WASH regulatory capacity building efforts and their impacts and effectiveness would help to build a baseline of knowledge in this area.

APPROACH 1.2: Build Institutional Capacity for Governance of WASH Sector

RESEARCH QUESTION 1.2.1

How can we best fill gaps in human resources capacity in the sector? What realistic programmatic incentives can be put in place to attract and retain highly qualified professionals within key institutions in the sector?

Human resources are critical to the functioning of regulators and service authorities. No improvements to institutional structures, policies, or operating procedures will last without qualified personnel in place. In many countries, recruiting quality personnel into key government positions is challenging, particularly at local levels. Retaining personnel following training or other interventions can be an additional challenge to partners attempting to fill human resource capacity gaps. While donors and development partners cannot solve this challenge alone, there is an overall lack of evidence on what structures and incentives have been tested to address human resource capacity gaps—other than more generous salaries. A review of what programmatic incentives have been put into place and their effectiveness would provide useful knowledge to governments and partners working to improve sector governance.

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[16] WaterAid. 2011. The Sanitation Problem: What Can and Should the Health Sector Do?

RESEARCH QUESTION 1.2.2

> ***What is the effectiveness of different collaborative approaches to improve governance within the water and sanitation sectors?***

Within the WASH sector, there has been increasing emphasis over the past years on "collective action," "collective impact," and other approaches for working collaboratively to solve challenges related to local governance of WASH services.[17] Collaborative approaches can be used to address a variety of issues. Of particular interest is how these can be used to bridge humanitarian and development actors to build resilience in areas of recurrent crisis. They can also be used to bring new stakeholders into decision-making processes. For example, the role of women as drivers for collective action holds promise, and can also improve gender equity outcomes. These approaches can also bring private sector actors together with communities, governments, and non-governmental organizations (NGOs) to address problems more holistically.

These approaches vary in their expected results, resources required, and degree of dependence among members of the group. There is still a lack of evidence on the effectiveness of these types of approaches under different contexts and for solving different challenges. In particular, an assessment of the financial and human resource implications of various collective approaches, including those that focus on coordinating humanitarian and development actors and projects in areas of recurrent shocks and stressors, will also be important for understanding when and how to apply collaborative approaches.

APPROACH 1.3: Mobilize Domestic and Commercial Financial Resources for Water and Sanitation

Filling the finance gap will be critical to achieve universal access to sustainable WASH services, and knowledge to fill this gap has shifted dramatically in recent years. The advent of new and innovative forms of available resources, especially in the context of blended public and private finances, have enabled the sector to think beyond simply taxes, tariffs, and transfers. Government, utilities, and banks now understand they must all collaborate to create water finance markets that are calibrated to local conditions.

While water utilities in many developing countries have begun to access commercial finance due to higher creditworthiness and various derisking tools, domestic public resources are still a critical component of sector finance, as not all services or providers will be able to utilize commercial finance. Mobilizing domestic resources requires the ability to raise tax revenue, appropriately budget, monitor finances, and execute funds. Citizen advocacy for services is one driver of domestic resource mobilization, as is a country's capacity to track finances and utilize information for improved budgeting.

RESEARCH QUESTION 1.3.1

> ***What are the enabling and constraining factors to structuring funds that blend public, donor, and private financing to reduce risk and enable increased finance for service providers?***

Using public finance (from donors or governments) to make investments more secure and digestible for private investors shows promise in attracting private capital that would not otherwise be invested directly in developing countries. This type of blended finance is increasingly being tested for WASH—via pooling

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[17] Sustainable WASH Systems Learning Partnership. 2020. Defining Collective Action Approaches for WASH.

bankable projects and risk management tools—and the initial results are promising. Blended finance addresses barriers to investment in developing countries, specifically, the lack of creditworthy borrowers who would otherwise not be able to access capital markets. While interest in blended finance is growing, the majority of the work to date on the topic has focused on describing the potential for blended finance and case studies. Less has been documented on lessons learned, best practices, and challenges in applying blended finance to specific geographies and contexts. Further study of the role of public policy in creating, monitoring, and evaluating blended finance is also needed.

RESEARCH QUESTION 1.3.2

What fundamental characteristics, conditions, approaches, and incentive structures are critical for water and sanitation service providers to effectively access commercial finance?

While there are many documents outlining a theoretical trajectory for how service providers can transition to commercial finance, only a few positive case studies are frequently mentioned. More work is needed to understand the broader enabling environment and policies that lead to critical steps in access to finance such as increased use of credit rating systems, clear asset ownership, and ring fencing of utility revenues, across different contexts. Additionally, national governments may need new approaches to segment their service providers to right-size finance deals to the right utilities, and right-size utilities/ management contracts to capture economies of scale within the manageable limits of operators. Governments and donors are now trying to create local water finance markets by directly brokering relationships between local banks and water utilities and supporting these new relationships. The effectiveness of this strategy and other approaches has not been well studied.

RESEARCH QUESTION 1.3.3

What are effective approaches to institutionalize financial tracking tools to improve a government's ability to budget, monitor, and track WASH financing?

Although WASH sector financing information exists, it is fragmented. Significant effort is needed to compile and consolidate information that is available. Tools to address this challenge have only been applied in a few countries and have not been incorporated as a regular practice by any national governments. While reports document the use of financial tracking tools, there are no systematic comparisons of these tools focused on their efficacy, impact on WASH finance, or the government's ability to budget, monitor, and track WASH financing more effectively. In general, there is a lack of evidence on how financial tracking tools affect sector performance. Answering this question is a precursor to understanding how financial tracking tools influence eventual budget execution and resources available to the sector, especially in the context of decentralization.

DEVELOPMENT RESULT 2: INCREASE SUSTAINABLE ACCESS AND USE OF SANITATION AND THE PRACTICE OF KEY HYGIENE BEHAVIORS

Sanitation and hygiene are important for health, nutrition, economic growth, environmental protection, personal security, and dignity, especially for women and girls.[18] Safe sanitation and hygiene are critical to reduce diarrheal disease, child mortality, malnutrition, neglected tropical diseases, and waterborne illnesses such as cholera.[19] Separating individuals and communities from human waste, properly treating fecal waste, and practicing key hygiene behaviors lessens the risk of illness. Safely managed sanitation can also lessen ground and surface water pollution, which is important for sustaining clean drinking water supplies and for the health of ecosystems and downstream users. Sanitation and hygiene interventions are among the most cost-effective development investments, contributing to individual and community economic output through reduced health care costs and gains in productivity as the burden of disease lessens and time available for work, leisure, and education increases.[20]

Despite compelling health and economic benefits, progress on sanitation and hygiene has lagged behind progress in access to drinking water. As of 2017, 2.3 billion people still lacked access to basic sanitation facilities, more than 890 million practiced open defecation,[21] and the majority of fecal waste from onsite sanitation systems was improperly managed, increasing the risk of contamination in water and food.[22] Sanitation progress is hindered by lack of political prioritization and weak demand from individual users. Unclear roles and responsibilities within government impede coordination and accountability, and limited human resources makes it difficult to find the diverse set of skills required to make sanitation progress, including engineering and construction, public health, housing policy, business and marketing, and behavior change.

Research to fill the evidence gaps and questions identified below are critical to informing how USAID and partners can help poor and underserved people and communities end open defecation, work toward universal safely managed sanitation, and create hygiene behavior change that lasts.

APPROACH 2.1: Improve Sustainable Sanitation Coverage

Common interventions to increase sanitation coverage have focused on community and individual behavior change and/or market-based sanitation. There is consensus that sustained and universal progress will only be achieved with programs targeting larger geographic areas than individual households or communities with interventions that also build on institutional capacity, systems, and resources.[23] Interventions like community-led total sanitation (CLTS) are not suitable in all areas and should be seen as but one option among an array of sanitation interventions that are deployed strategically in an area-wide approach, where administrative units are used as entry points for improvement.[24] A suite of approaches should be adapted for each specific context within the targeted area-wide geography.[25] Questions remain on how to combine these interventions to ensure sustainable uptake, reach scale, and target the poor, while ensuring wide, lasting

[18] Andres, L. et al. 2018. Overview and Meta-Analysis of Global Water, Sanitation and Hygiene Impact Evaluations. Policy Research Working Paper 8444. World Bank Group.

[19] WHO. 2018. Guidelines on Sanitation and Health. Geneva.

[20] Hutton, G. 2015. Water and Sanitation Assessment Paper: Benefits and Costs of the Water Sanitation and Hygiene Targets for the Post 2015 Development Agenda. Copenhagen Consensus Center.

[21] WHO and UNICEF. 2017. Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines. Geneva.

[22] World Bank Group. 2014. The Missing Link in Sanitation Service Delivery. A Review of Fecal Sludge Management in 12 Cities. Water and Sanitation Program Research Brief.

[23] Plan International UK, SNV, UNICEF, WaterAid, World Bank, and WSSCC. 2019. A Call to Action: Delivering Rural Sanitation Programs at Scale, with Equity and Sustainability.

[24] USAID. 2018. An Examination of CLTS's Contributions Toward Universal Sanitation.

[25] WaterAid, Plan International, and UNICEF. 2019. Guidance on Programming for Rural Sanitation.

coverage. This broad question must also be explored across many varied contexts. Few proven approaches improve containment of human waste in highly dispersed or pastoral areas. The realities of ongoing urbanization and migration will also affect USAID's programming approaches across its portfolio.

RESEARCH QUESTION 2.1.1

How can we target, integrate, and phase behavior change and market-based activities in different contexts to achieve universal sanitation coverage within an administrative area?

The WASH sector generally, and USAID in particular, has invested heavily in learning about some of the most common social mobilization interventions (such as CLTS) to better understand their performance envelope. There has also been parallel learning on the roles that market-based sanitation and other supply-side activities can play. However, the sector is only beginning to see how these activities can be combined, integrated, and phased appropriately to reach everyone in large-scale, area-wide programs. Addressing this knowledge gap may include learning about whether more explicit sales campaigns should occur before/after triggering, which actors (public, private, or nonprofit) should carry out each activity, or how to approach customer segmentation. As administrative areas are the unit of intervention, urbanizing towns may require adapting concepts and tools from city-wide inclusive sanitation approaches. Additionally, the sector must learn how monitoring can be improved and how these data can be used for adaptive implementation, exploring policy reforms, or generating stronger political leadership. These learning activities must incorporate the role of governance, institutional capacity, regulation, and enforcement.

RESEARCH QUESTION 2.1.2

What is the role of subsidies in area-wide sanitation programs? What should drive the size, timing, and modality of subsidies?

Reaching the poorest and most vulnerable people has been a fundamental challenge in the sanitation sector, with most programs, including CLTS and MBS approaches, struggling to reach people with disabilities, widows, and people excluded based on caste, religion, ethnicity, location, or gender. Schools and health care facilites are also often left behind. Although demonized in the sanitation sector for more than a decade, targeted subsidies appear to be a necessary piece of the intervention mix. Subsidies can be structured in many ways, from the household level to the national sector level, and can target subsets of people (potentially below a given wealth threshold) and institutions (including schools and health care facilities). They also must be carefully phased and targeted when combined with demand creation and market-based activities. These nuances are poorly understood in many contexts and require intense engagement with government institutions, regulators, and private sector actors, making them difficult to test and evaluate. Behavior change at the institutional and political levels may be one aspect warranting further exploration.

APPROACH 2.2: Improve Fecal Sludge Management

The world has more sanitation facilities than ever before, requiring increasing priority to also ensure safely managed sanitation services. Moving toward safely managed sanitation requires both scaling up of relatively new technologies and the formation of effective and efficient service providers, especially in cities and urban growth centers. Policymakers, sanitation authorities, and service providers must make decisions about managing excreta from both sewered and on-site sanitation facilities, complicating the planning for infrastructure and other investments. Given the sector's current financing gap, cost effective solutions must be tested before service providers will be viable and therefore can scale-up naturally. Finally, there are some lingering questions about how to operationalize safe disposal of human feces in certain contexts, especially in urbanizing towns, peri-urban areas, or in pastoral contexts.

RESEARCH QUESTION 2.2.1

What solutions exist for safe excreta management in peri-urban areas, towns, and rural growth centers?

A wide variety of technical approaches to achieve safely managed sanitation have been introduced and validated in different contexts. There are clear and significant gaps in operationalizing and scaling up these systems-level approaches, especially in evolving and urbanizing communities. The WASH sector has traditionally taken distinctly different approaches to sanitation in urban and rural areas, however, this distinction is increasingly unorganized as rural communities urbanize and as small towns grow increasingly dense. Even programming in rural areas should conduct operational research to support district capitals, trading towns, and rural growth centers to learn how to mix on-site and off-site sanitation, encourage institutions to support safe treatment/disposal, and ensure poor and otherwise marginalized people aren't left behind.

RESEARCH QUESTION 2.2.2

How can interventions to professionalize FSM service providers best contribute to their business viability?

Programs focused on professionalizing FSM service providers have struggled to make these businesses independently viable. Some factors that legitimize these businesses can increase operating costs (such as safe treatment or disposal), while efficiencies in revenue generation do not always make up the difference. Some promising developments have been piloted (scheduled desludging, price transparency, technological innovations, beneficial reuse, etc.), but robust evidence is still lacking, including on the role that the overall structure and regulation of the FSM sector can play in influencing business viability. Research must explore effective approaches to organize the FSM sector to contribute to business viability, regulation of collection, dumping, and treatment, and investment in infrastructure. New interventions also need to be explored to ensure that enterprises promote gender equity and to retain an effective and efficient workforce. An analysis of broader factors in the institutional environment is also necessary to understand the incentives at play for achieving city or area-wide inclusive sanitation.

APPROACH 2.3: Consistent Practice of Key Hygiene Behaviors

While reliable service delivery is necessary to accomplish Development Results 2, 3, and 4, it is not sufficient. Simply providing infrastructure without a critical look at user preferences and motivations decreases the chances that the products or services will be used and maintained. On the other hand, promoting adoption of new practices without addressing the necessary infrastructure, products, or services makes behavior change challenging, if not impossible in the case of some important behaviors, such as handwashing with soap. There are wide evidence gaps on how to design programs to improve uptake and consistent practice of a range of behaviors that target improved hygiene and sanitation.[26]

In the case of many WASH behaviors, current evidence points to the limitations of behavior change efforts that rely exclusively on increasing knowledge or on interpersonal communication channels. These are labor intensive, can be difficult to scale, and once interventions stop, the behaviors will not be maintained.[27] Structural or physical changes to the environment, such as the installation of piped water within a home, may prove to be more effective in enabling habit formation as stand-alone interventions or in combination with communication activities, though the evidence base needs to be built on the most efficient and effective sets of interventions. Specifically, research is needed to inform new and innovative hygiene behavior change approaches, which incorporate both behavior change communication and changes in the physical environment.

RESEARCH QUESTION 2.3.1

> *How do changes to the physical environment enable key behaviors in different contexts? What other complementary activities may be needed to enable sustained behavior change?*

Frequent and habitual behaviors are significantly influenced by context, cues, and the physical environment.[28] Running water available on premises, including within health care facilities, schools, and other institutions, is ideal to enable many hygiene practices, such as handwashing, but how does the location (for example, inside or outside the home) or intermittent availability of this service affect its use? Are there other desirable products that can enable key behaviors where running water is not feasible? Pilot activities have shown strong results in using nudges to enable handwashing with soap. More evidence is needed on how to apply scalable and effective interventions across all target behaviors and contexts. Where communication plays a role, what is the required dose, frequency, and duration required to sustain behaviors, and is this going to be cost-effective? Social and behavior change research in WASH must be more customized to the individual behaviors. Under-emphasized domestic hygiene behaviors (such as animal feces management, or purchase decisions like piped water connection or latrine emptying) may be prioritized social and behavior change programs but require a deeper understanding of the behavioral determinants in to inform intervention design.

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[26] Hygiene behaviors include handwashing with soap at critical times, safe food hygiene, safe disposal of excreta (including of children and animals), safe drinking water management, and practices that lead to improved menstrual health and hygiene. Note that other behaviors may play a role in accomplishing other development results such as household acceptance of treated water sources (including willingness to pay for connections and monthly tariffs), community maintenance of water or sanitation infrastructure, conserving water, or protecting communal water sources, among others.

[27] Pickering, A., et al. 2019. The WASH Benefits and SHINE Trials: Interpretation of WASH Intervention Effects on Linear Growth and Diarrhea. The Lancet Global Health.

[28] Global Handwashing Partnership. 2017. From Behavior Initiation to Habit Formation.

> *What are current practices around safe food hygiene and child or animal feces management? What behavior change interventions can be employed to improve and sustain safe practices?*

Historically, research on WASH behaviors has been heavily focused on two behaviors: handwashing with soap and uptake of latrines.[29] While more is known about the behavioral determinants that drive adults to adopt and use latrines, much less is known about the factors that affected safe disposal of children's feces. As data accumulates showing the potential for alternative routes of fecal contamination, including from domesticated animals, efforts to explore other hygiene behaviors have increased.[30] With regards to safe food hygiene or animal feces management, significantly more research is needed to provide, firstly, descriptive data that identifies what individuals and households are doing and, secondly, deeper analysis of the behavioral determinants that affect those practices. Additional evidence on innovative interventions to disrupt other neglected contamination pathways may also be necessary. This question is also relevant to animal husbandry and livestock programming, as it may inform how to achieve the positive benefits of livestock ownership while mitigating potential negative impacts from animal feces in the household environment.

DEVELOPMENT RESULT 3: INCREASE SUSTAINABLE ACCESS TO SAFE DRINKING WATER

Globally, 844 million people still lack access to even a basic drinking water source—the very resource on which a healthy, productive life depends. Health care facilities and schools also suffer from lack of sustainable access to safe water for drinking and hygiene, with an estimated one in eight health care facilities globally lacking a water service.[31] Even for those who have access, services are often inadequate to meet basic needs, are contaminated from pollutants, or are unreliable. Access levels are lowest in rural areas, and this has been the traditional focus of USAID investments.[32] While rural water programming will remain a core focus moving forward, the rapid pace of urbanization requires increasing attention on urban services and utilities, particularly in dense informal settlements and secondary cities or smaller towns that are often served by informal providers. Even where formal utilities exist, they often lack the capacity to ensure consistent service delivery in the face of a growing population.[33] Reaching peri-urban and urban residents with reliable, quality water service is critical to improving public health, preventing infectious disease outbreaks, and enabling economic activities.

Under this development result, USAID focuses on promoting sustainable drinking water to households, schools, and health care facilities by working to professionalize services—including increasing revenue, regularizing monitoring, and strengthening maintenance practices—in the face of a changing climate, increased water scarcity and stress, and increasing pollution. Research to fill evidence gaps and questions identified below are critical to inform how USAID and partners can help service providers sustainably expand at least basic services to poor and underserved people and communities and improve water service quality with the aim of achieving safely managed services.

29 White, S. Hasund Thorseth, A., Dreibelbis, R., Curtis, V. 2020. The Determinants of Handwashing Behaviour in Domestic Settings: An Integrative Systematic Review. Environmental Health. Vol. 227.

30 USAID. 2018. Toward a Hygienic Environment for Infants and Young Children: A Review of the Literature. Washington, DC. USAID Water, Sanitation and Hygiene Partnerships and Sustainability Project.

31 WHO and UNICEF. 2019. WASH in Health Care Facilities: Global Baseline Report 2019. Geneva.

32 WHO/UNICEF Joint Monitoring Programme. 2019. Progress on Household Drinking Water, Sanitation, and Hygiene 2000-2017. Special Focus on Inequalities. New York.

33 Kumpel, E. and K.L. Nelson. 2016. Intermittent Water Supply: Prevalence, Practice, and Microbial Water Quality. Environmental Science and Technology.

APPROACH 3.1: Improve Performance of Rural Water Services

As rural water supply coverage rates rise across many countries, attention is increasingly shifting to ensuring that this improved access is sustained over time. Over the past decade, studies have repeatedly cited nonfunctionality figures for rural water schemes of between 30 and 40 percent.[34] Addressing the challenge of functionality will require a focus on operations and maintenance models, governance, and associated financing to ensure that services continue to be delivered.

RESEARCH QUESTION 3.1.1

Under what contexts, including the level of support or oversight given, are community-managed water services more likely to be sustainable? What alternative management models exist when these enabling factors are not in place?

For the past several decades, conventional approaches to maintenance for rural water services have largely been based on voluntary community-based management (CBM), with communities taking on the burden of tariff collection, operations, and maintenance themselves, with limited, if any, support from external agencies, local governments, or technical operators. However, these volunteer committees struggle to ensure that rural water infrastructure is adequately maintained, with "fix on failure" becoming the default approach in most cases, resulting in lengthy downtimes and more costly repairs. While some countries are moving toward replacing CBM with alternative management models that are more common in urban areas (i.e., private or public utility solutions), in most countries, CBM will remain the predominant approach due to the challenges of managing large numbers of small, dispersed water supply schemes. However, supported community management models can be designed that will have different community functions depending on context.

The major questions in this area, therefore, are not about whether traditional, unsupported, volunteer community management is an appropriate service delivery model. Evidence shows that CBM without support structures or capacity strengthening will struggle to sustain high levels of service demanded by the Sustainable Development Goals (SDG).[27,35] Instead, information is needed to inform different possible arrangements of management roles, the external support provided to communities, and the appropriateness of these management models in different socio-economic and institutional contexts, including in the face of severe shocks like droughts and floods. It will also be important to explore alternatives to CBM in contexts where the required support and enabling environment is not available to ensure sustainable services to support households, livelihoods, and institutions like schools and health care facilities.

34 World Bank. 2017. Sustainability Assessment of Rural Water Service Delivery Models: Findings of Multi-Country Review. Washington, D.C.
35 Sustainable WASH Systems Learning Partnership. 2019. Sustaining Rural Water: A Comparative Study of Maintenance Models for Community-Managed Schemes.

RESEARCH QUESTION 3.1.2

What are the opportunities and limitations of information and communications technologies (ICT) in terms of improving monitoring, planning, and operating drinking water services? What complementary capacities are required among service providers and authorities to utilize ICT to improve service delivery?

Advancements in technologies for monitoring drinking water are opening new possibilities to strengthen service authority and service provider oversight of rural water services, reducing monitoring costs, increasing resilience, and improving asset management. Questions remain, however, about how such technologies affect service levels under different contexts, including in the face of shocks and stressors. This question is not focused on the development of new technologies, but rather when and how existing technologies should be applied to improve rural water services, especially in terms of improved monitoring, but also extending to how it may improve planning and operations of drinking water services. These questions may also interact with other Development Results since these ICT tools can be used to monitor water resources, ensure extractions adhere to approved uses (such as domestic water supply), and track water quality parameters that may be affected by sanitation services. There is also a need to better understand the factors that enable the most effective use of technology and what complementary interventions need to be combined with the introduction of ICT solutions.

RESEARCH QUESTION 3.1.3

Which financing approaches are the most viable for rural water services and which are most likely to be sustainable?

Cost recovery for rural water service provision is difficult to achieve, particularly in areas with highly dispersed or vulnerable populations. Research to date shows that in many places, rural water users are demanding and paying for services, but the revenue is insufficient to cover the full operating costs in many cases. The opportunities for commercial finance with positive returns is limited in these areas. Approaches such as block grants from higher levels of government, cross subsidies, and local revenues from markets have been proposed to fill this gap. Further work is needed to understand and assess approaches that can sustainably cover this finance gap for rural water services, which is often a key impediment for private sector engagement.

APPROACH 3.2: Improve Performance of Urban Water Utilities

Global rates of urbanization are creating additional pressure on services in towns and cities, making functioning water utilities increasingly vital. Despite their importance, utility performance generally lags in low-income countries, and utilities will need to improve current levels of performance and respond to this growing demand. Many of the technical issues regarding utility operation are well understood. The main challenges identified are centered on institutional structures, leadership, performance benchmarking, and incentive systems that can motivate utilities to find ways to improve services and respond to changing pressures in dynamic urban environments.[36]

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[36] World Bank. 2018. *Water Utility Turnaround Framework: A Guide for Improving Performance.*

RESEARCH QUESTION 3.2.1

How can incentive structures motivate the performance of utilities to expand access to unserved and underserved areas and institutions?

There is a critical gap in understanding how to design and implement performance incentives within utilities so that individuals and operational units genuinely strive to perform well. Incentives can take many forms and be financial, political, accountability, promotional, or recognition based. For example, performance benchmarks have the potential to drive performance and motivate utilities to creatively adapt methods to achieve targets. Policy and regulatory reform can also create incentives and trigger improvements. Incentives can also being created during urban planning processes to avoid the later costs of retrofitting infrastructure be passed along to unplanned settlements. However, it is critical that these approaches do not create an unintended incentive to avoid providing services to poor and vulnerable communities, households, and institutions where cost recovery may be more difficult. Further work is needed to understand how such arrangements can be designed and implemented, both within and between utilities, in either regulatory or funding bodies. Evidence on the lasting effectiveness of setting up such incentive structures is also critical to understand how to sustainably improve utility performance.

RESEARCH QUESTION 3.2.2

What are the costs and associated benefits of different approaches to increase revenue collection by utilities, and how should this be done without negatively impacting the poor and vulnerable?

Financial resources are critical for a utility's successful operation. Utilities must cover daily operational expenses, replace infrastructure as it reaches the end of its service life through capital maintenance expenditure, and plan for extension of services through new capital expenditure, particularly for growing urban populations. Utilities in low-income countries frequently struggle with non-revenue water, which requires improved revenue collection from water users (reducing apparent losses), as well as repairing/replacing assets (reducing real losses). Strategies to address this can include technical solutions, such as installation of prepaid meters, operational changes to billing systems, and policy reforms. A better understanding of the effectiveness of strategies to increase revenue collection is necessary to address this challenge.

There is, however, a tension between affordability and financial sustainability. Services should be priced at a rate accessible to the most vulnerable populations, while still recovering enough revenue to be financially viable. Pro-poor tariffs are not a new concept, but a fundamental challenge remains with developing models to differentiate water pricing that is socially and politically acceptable to utility customers and that can withstand shocks, such as those associated with COVID-19. Understanding how to design and implement strategies to provide equitable access while simultaneously meeting conditions for financial sustainability is a critical area for further work.

RESEARCH QUESTION 3.2.3

How do different methods of providing technical assistance affect utility capacity and performance, and how does effectiveness vary by context and the approach to providing technical assistance?

Given that successful utility reform efforts depend on skilled and committed leadership and qualified staffing, a common approach for donors to improve utility performance is to offer technical assistance. There are many approaches to offering technical assistance designed to build different aspects of utility capacity, such as through formal training, twinning arrangements, staff augmentation, and mentoring, but an assessment of the effectiveness of such approaches is needed. Further research is also needed to understand under what conditions technical assistance is likely to produce lasting outcomes and what approaches to providing technical assistance are best suited to different contexts. Published case studies of both successes and failures would help implementers determine the best approach for their context.

APPROACH 3.3: Improve Drinking Water Quality

The introduction of "safely managed" drinking water in SDG 6.1 has renewed emphasis on water quality as a global priority. Achieving this goal requires governments and water service providers to prioritize both routine monitoring and actions to improve water quality. Technologies and methods for both water quality testing and treatment are well developed, yet applying them consistently and at scale remains a considerable challenge, especially in low-resource environments. More research is thus needed on application of water treatment tools and scaling options.

RESEARCH QUESTION 3.3.1

What factors and models improve routine water quality monitoring and water safety in resource-poor environments?

Recent research has found that water quality monitoring is not always performed consistently, even when dedicated resources are provided to facilitate it.[37] Because household water treatment has not been found to be an effective way to sustainably address water quality,[38] it is preferable to treat water before distribution rather than providing technologies for household-level treatment. Water quality regulations embedded into many country's official frameworks are often unreasonable, and there is often overlapping or unclear regulatory oversight spread between different line ministries. More information is needed around what factors can enable or incentivize routine water quality monitoring by service providers or service authorities and use of the data to improve the quality of water services. There is a need to better understand the options for water quality monitoring systems and how these function under different contexts. Research under this question will also examine the effectiveness of approaches to ensuring monitoring data is acted on and water quality is improved.

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[37] Peletz, R., et al. 2018. Why do Water Quality Monitoring Programs Succeed or Fail? A Qualitative Comparative Analysis of Regulated Testing Systems in Sub-Saharan Africa. Vol. 221.

[38] Ojomo, E. et al. 2015. *Sustainability and Scale-Up of Household Water Treatment and Safe Storage Practices: Enablers and Barriers to Effective Implementation.* International Journal of Hygiene and Environmental Health, Volume 218, Issue 8.

DEVELOPMENT RESULT 4: IMPROVE MANAGEMENT OF WATER RESOURCES

The next decades will be characterized by mounting pressure on freshwater resources. Already, at least two-thirds of the global population—more than 4 billion people—live with severe water scarcity for at least one month every year,[39] while water use has been rising at more than twice the rate of population growth in the last century. USAID seeks to help partner countries and communities better cope with rising pressures on freshwater resources and increase their resilience through investments that promote equitable, sustainable, and long-term management of increasingly polluted, scarce, and/or variable water supplies.

A reliable supply of freshwater is essential for drinking water and other domestic uses, and also for agriculture, industry, and power generation, which together account for the majority of freshwater use globally. Together with population growth, increasing withdrawals of water to support these sectors are contributing to an increase in water demand. Climate change is already and will continue to alter the availability of freshwater in many parts of the world, multiplying water-related risks and potentially undermining the resilience of people and economies that are reliant on already scarce, variable, and/or dirty water supplies. Water quality, while less well monitored and understood, appears to be declining or compromised in many areas, which adds to water stress.[40] If these pressures are not addressed, regions across the world could see their economic growth rates decline around 6 percent of Gross Domestic Product by 2050.[41]

Under this development result, USAID focuses on promoting equitable, stakeholder-driven water resources planning and allocation; enhanced water availability and quality in watersheds through improvements to land use practices and investments in pollution control; and adaptive innovations to build resilience, foster cooperation, and reduce water-related risks for vulnerable households, communities, nations, and regions.

USAID priorities for implementation research under Development Result 4 were selected to bolster the evidence base for two key programmatic approaches. Addressing these evidence gaps will help USAID and others work more effectively with poor and underserved people, communities, and their governments to enhance the prospects for sustainable and equitable access to water resources.

APPROACH 4.1: Implement Water Resources Management and Allocation Planning

Effective WRM involves planning, developing, and allocating available water resources and infrastructure for sustainable and equitable use. USAID considers implementation research on the topics below as priorities for improving the evidence base on how to best design and implement programs to improve water resources and water allocation planning.

RESEARCH QUESTION 4.1.1

> ***What are the priority obstacles to address in order to implement holistic water resources planning (such as integrated water resources management) in low- and middle-income countries, and how can these obstacles be overcome?***

Integrated water resources management (IWRM) is widely accepted as a WRM process that seeks to promote "coordinated development and management of water, land and related resources in order to

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[39] Mekonnen, M.M., and A.Y. Hoekstra. 2016. Four Billion People Facing Severe Water Scarcity. Science Advances.

[40] Damania, R., S. Desbureaux, A.S. Rodella, J. Russ, and E. Zaveri. 2019. Quality Unknown: The Invisible Water Crisis. Washington, DC: World Bank.

[41] World Bank Group. 2016. High and Dry: Climate Change, Water, and the Economy.

maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment."[42] Many critical basins lack overall WRM and allocation plans and/or the institutions, capacities, and funding to effectively develop and implement them. Consequently, USAID frequently assists partner countries and communities to adopt IWRM, and to develop and implement complementary WRM plans. Prioritizing the key obstacles at the margin that hamper our ability to effectively implement IWRM or of other holistic frameworks and processes is critical, recognizing that true success in WRM hinges on fundamental shifts in power dynamics among and between water users, especially the poor and vulnerable, and including ecosystems and wildlife. This includes the need to better understand what drives the enforcement of policies, laws, and conventions; what barriers exist to attracting funding (both public and private) for WRM; learning more about the enabling conditions for stakeholder empowerment and capacity-building; and increased understanding of different approaches to water tenure or water rights and the relationship between tenure and equitable allocation and access. Understanding how to develop and foster governance structures and approaches that are adaptive to ecological and social change, including uncertainties associated with climate variability and change, is also particularly important.

RESEARCH QUESTION 4.1.2

What are the most effective and efficient methods (in terms of both hardware and institutional strengthening) to improve monitoring of surface and groundwater quality and quantity in resource-constrained environments?

USAID routinely invests in improving the availability of data to foster evidence-based decision-making, transparency, and accountability on resource availability and management. However, routine monitoring of both surface and groundwater quantity and quality remains an enormous challenge in many of the communities and partner countries in which USAID works. For example, the widespread adoption of unmetered or unmonitored solar water pumping (especially for agriculture) poses a risk to water security and sustainable resource allocation. Investments in infrastructure and capacity for increased monitoring can fail to pay long-term dividends due to issues of scalability, lack of operations and maintenance, and insufficient incentives and capacity to sustain data collection, management, and use. Thus, USAID sees it as a priority to grow the evidence base on how to more effectively incentivize and improve routine monitoring of water resources.

RESEARCH QUESTION 4.1.3

How can water resources planning more effectively reduce the marginalization and increase the empowerment of women and other vulnerable people?

A growing body of evidence suggests that gender equality and women's empowerment is tightly connected to how water resources are allocated and developed. Many USAID activities seek to include women and other marginalized populations in WRM planning at different scales, but more information is needed around how to best amplify women's agency in WRM policymaking, planning, and implementation. Women's engagement can ultimately improve water-related outcomes for social benefit (such as

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[42] IWRM is a process for improving water resources management that has been incorporated as a goal under SDG 6. IWRM explicitly recognizes the connection among water, land, and people, and actively engages stakeholders to weigh trade-offs and identify the most important water management investments, taking into account the various users and uses of water as well as the environment. The Global Water Partnership defines IWRM as "the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

improving health, education, and household time-savings). In filling this evidence gap, USAID seeks to understand more about the links between water resources management and other marginalized groups, including the intersections of gender, social class, ethnicity, etc., and about how best to empower indigenous communities in the context of water resources decision-making.

APPROACH 4.2: Protect and Rehabilitate Watersheds

Activities that increase or sustain the availability of water over time can greatly enhance the success and resilience of water management strategies. The same can be said for activities that improve water quality so that more is available for human use and to maintain ecosystems. Managing land use, preventing or reversing ecosystem degradation, and planning green infrastructure within critical watersheds can provide lasting benefits, often more cost-effectively than grey infrastructure. In response, USAID has worked within watersheds to promote catchment restoration and improve water-related ecosystem services, which can have beneficial secondary effects on reducing treatment costs for domestic water services.

RESEARCH QUESTION 4.2.1

How can watershed management interventions be targeted, integrated, and phased in to optimize improvements in water quality and availability within catchments?

While there is a robust body of knowledge on successful technical approaches to restoring watersheds through land rehabilitation and installation of green and grey infrastructure, it is less clear how to target and sequence interventions to ensure that limited resources for watershed management are effective at improving water quality and/or quantity and reliability. Similarly lacking are decision support tools for optimizing investments and interventions to improve the availability and quality of water within catchments and in downstream areas. Gaps associated with biophysical aspects of interventions are important, but social components are equally critical. What is the role of bridging organizations (such as extension agencies) in facilitating cross-scale benefits associated with watershed management interventions? What planning processes and governance structures help enable these practices?

RESEARCH QUESTION 4.2.2

What policies, institutional frameworks, and other enabling factors best incentivize green and other resilient infrastructure in low- and middle-income countries?

There are many types of water, sanitation, and water management interventions and infrastructure choices available to utility managers and communities; these include traditional gray infrastructure such as dams, pipelines, water and wastewater treatment facilities, and stormwater systems, as well as green and blue-green infrastructure[43] or other ecosystem-based approaches that harness the natural environment to achieve water management objectives. Gray infrastructure is increasingly vulnerable to climate variability and change, including extreme events like floods. Green infrastructure can be a lower-cost, more climate-resilient alternative to traditional gray infrastructure for increasing or maintaining water supply and quality in many cases and sometimes provides co-benefits outside the water sector. Gray infrastructure can also be sited, designed, and built to be more climate resilient and thus more cost-effective in the long term.

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[42] Green infrastructure is often defined as any engineered structure that uses vegetation, soils, and natural processes to manage water and create healthier built environments for people and the natural resources that sustain them. Green infrastructure can range in scale from small-scale technologies such as rain gardens and green roofs to regional planning strategies targeting conservation or restoration of natural landscapes and watersheds.

Ramping up both green and climate-resilient gray infrastructure are important for long-term adaptation to climate change, including managing risks from droughts and floods, and for reducing overall costs of procuring and treating water.

There are many options and strategies for green and climate-resilient gray infrastructure that have proven effective, especially in higher income settings, such as conservation reserve programs for farmers, nature-based or green-gray stormwater management systems in cities, or riparian buffers. However, questions remain about the efficacy of different approaches, as well as how to allow for/enable/facilitate greater awareness and uptake in low- and middle-income countries, such that the natural capital that underpins sustainable development can be protected and enhanced.

RESEARCH QUESTION 4.2.3

What are the enabling factors and constraints most important to establishing successful schemes for domestic source water protection, such as payment for ecosystem services or the establishment of other environmental taxes or fees, especially in low income contexts?

Green and resilient water infrastructure can benefit many sectors, but may be particularly beneficial for protecting drinking water supplies. There are rising challenges to the freshwater resources that are used as source waters for domestic supplies for growing populations. These include land use changes, pollution, and climate variability and change. As a result, reservoirs are shrinking, supplies are critically low or unreliable during prolonged dry and hot seasons, and more resources are required for treatment to bring water supplies up to acceptable quality standards. For many growing population centers, deforestation and degradation increase pollution, accelerate erosion, and reduce water quality and reliability. Targeted land protection and restoration measures have the potential to ease pressures on critical source waters used by cities and growing towns. These solutions may be the most cost-effective way to secure reliable and safe water for drinking water systems over the long run, though more information on the return on investment for such interventions is also needed in low income settings. Finding innovative ways to establish sustainable funding and management schemes for source water protection has been challenging, particularly in the countries in which USAID works. Implementation research to identify effective models and associated enabling factors and constraints will bolster progress on protecting and restoring watersheds that provide source water for growing cities and population centers.

APPROACHES FOR IMPLEMENTING AGAINST THE RESEARCH AGENDA

USAID intends to work through a broad range of collaborative partnerships to refine research questions articulated within this agenda and develop research approaches to surface new sector evidence and ensure that findings are readily applied to programming and policy-making. This includes partnerships with multilateral organizations, universities, other U.S. Government (USG) agencies, the private sector, and NGOs. Engaging in results-driven collaborative partnerships that leverage the relative strengths of each institution will be a prime modality for implementing research under this agenda (Figure 4).

Universities & Research Institutions
Bring deep technical expertise and build capacity

Implementing Partners
Bring deep technical expertise and on-the-ground know-how

Intra- & Inter Agency Collaborations
Leverage the broad expertise and resources of USAID and USG with potential for bidirectional uptake of findings

Private Sector
Leverage additional resources for aligned investments with novel dissemination channels

Communities
Bring on-the-ground know-how and acute understanding of challenges, opportunities, and priorities

Multilateral Organizations
Bring additional resources for aligned investments with potential for bidirectional uptake of findings

Donors
Provide additional resources for aligned investments and mutual learning

Partner Governments
Bring deep technical expertise with potential for bidirectional uptake of findings

FIGURE 4: STRENGTHS AND ROLES OF DIFFERENT TYPES OF ORGANIZATIONS WITHIN THE RESEARCH ECOSYSTEM
PHOTO: Neighborhood Tracking Activity in Makassar City, South Sulawesi, Indonesia. Photo by Lidiastuty Anwar/USAID IUWASH PLUS SSEI.

Research Mechanisms

This agenda is intended in part to coordinate and integrate the implementation of sector research across USAID, including current and future research programs and activities, both Headquarters- and Mission-funded. Currently, USAID conducts water and sanitation research through a number of existing mechanisms that are managed out of different Operating Units across the Agency. These partnerships work in different ways and represent the broad coalition of partners that USAID relies on and will continue to rely on to generate new sector knowledge and, more specifically, to execute against this agenda. USAID foresees that the agenda will be used as an additional guide for existing research activities, new research activities, and embedding implementation research in relevant bilateral USAID Mission programming. Many of these activities that fall under the Water and Development Plan will be able to align with the objectives and priorities articulated herein.

Using Relevant Research Findings throughout Program Cycle

It is expected that research findings will be used by multiple USAID Operating Units throughout the Program Cycle—from initial strategy development to activity design, implementation, and monitoring and evaluation. Mission WASH programs and activities may also use this agenda to help guide the development of learning agendas, research questions, and evaluations that are most relevant to their investments.

USAID has a strong commitment to collaborating, learning, and adapting throughout all of its programming. Ensuring that we are asking the most important questions and finding answers that are relevant to decision-making was a primary goal of the process for developing the research questions that make up this agenda. Using findings from research implemented in line with this agenda to inform decision-making and to adjust field activities will be equally important. Reports, papers, and other research products developed will be widely disseminated, and data will be made available on USAID's Development Data Library.

USAID expects to use evidence generated to inform technical guidance notes, staff training packages, and other materials. Washington-based water advisors will convene regular meetings to reflect on research findings and implications for field programming. These will also inform adaptations to this agenda as needed. Public events such as workshops, conference presentations, and webinars will also be held to discuss research findings.

CONCLUSION

The approaches, evidence gaps, and research questions discussed herein are by no means exhaustive. This agenda represents USAID's top priorities for evidence generation within the Water and Development Plan to improve programming and will be used to guide USAID's research investments. It aligns with USAID's Water and Development Plan in support of the GWS and is intended to help achieve the goal of increasing the availability and sustainable management of safe water and sanitation for the underserved and most vulnerable.

This agenda is meant to complement the work being done by others in the sector and contribute to the global knowledge base. As the sector learns and changes implementation approaches, revisions to the agenda may be necessary. USAID looks forward to learning together with the rest of the water security, sanitation, and hygiene sector.