Reducing Inequalities in Water Supply, Sanitation, and Hygiene in the Era of the Sustainable Development Goals

Synthesis Report of the WASH Poverty Diagnostic Initiative

WORLD BANK GROUP

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Acknowledgments

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Abbreviations

B40   bottom 40 percent *(of asset wealth distribution)*

DALYs   Disability-Adjusted Life Years

DHS   Demographic Health Survey

DNAAS   National Directorate of Water Supply and Sanitation

DRA   demand-responsive approach

GBD   Global Burden of Disease

GDP   gross domestic product

HAZ   height-for-age Z score

HOI   Human Opportunity Index

JMP   Joint Monitoring Programme

LGUs   local government units

MDGs   Millennium Development Goals

O&M   operation and maintenance

ORT   oral rehydration therapy

PPPs   public-private partnerships

PRM   Poverty Risk Model

SDGs   Sustainable Development Goals

T60   top 60 percent *(of asset wealth distribution)*

UN   United Nations

UNDP   United Nations Development Programme

UNICEF   United Nations Children's Fund

WASH   water supply, sanitation, and hygiene

The WASH Poverty Diagnostic Initiative covers 17 countries and the West Bank and Gaza. For purposes of convenience, this report refers to the 18 entities collectively as countries or, less frequently, as economies.

Key Facts by Country

New evidence from 18 countries around the world shows significant inequalities in water between rural and urban, poor and non-poor, and regions within countries.

Haiti

Children in the bottom 20% (household income group) have **2.4x the risk** of contracting an enteric disease than children in the top 20%.

Guatemala

Only **33%** of indigenous populations have access to improved sanitation, compared to **70%** of non-indigenous populations.

Panama

Under a conditional cash transfer program, schools with **better WASH services** have **lower dropout rates,** esp. among girls.

Ecuador

42% of people in the bottom 40% lack access to improved sanitation, compared to only **17%** of the top 60%.

Tunisia

The bottom 20% receive only **11%** of water & **10%** of sanitation subsidies, whereas the top 20% receive nearly **27%** of water and **33%** of sanitation subsidies.

Niger

90% of rural Nigeriens defecate in the open; **51%** don't have access to improved water. But most donor funding for WASH goes to the urban areas.

Nigeria

Access to piped water in urban areas declined from **32% in 1990 to 7% in 2015.**

Congo, Dem. Rep.

Improved access to water in cities towers at **81%,** compared to only **31%** in rural areas.

Mozambique

90% of underweight mothers only have access to unimproved sanitation.

Pakistan

District WASH budgets are not correlated to residents' need and poverty level.

Bangladesh

41% of improved water is contaminated with *E. coli* at the source.

Tajikistan

Households in the Sughd region have piped water only **1 day per week.**

West Bank & Gaza

Despite near universal access to piped water, access to non-contaminated improved sources of water averages only **10%** in Gaza.

Ethiopia

Wealthier households in urban areas are **4 times** more likely to have piped water on premises than poorer households.

Yemen, Rep.

63% of the population in the top 20% (household income group) has access to piped water, compared to **35%** of the poorest.

India

56% of the population in the top 20% (household income group) has access to piped water, compared to **6%** of the bottom 20%.

Indonesia

During the first 1,000 days of life, children are **11 percentage points** more likely to be stunted if living in communities with higher levels of open defecation.

Tanzania

Within the first year of construction, **40%** of water points were reportedly not working.

Executive Summary

London, United Kingdom, 1858.

Sanitation was considered a private good, and not a concern of the state. The better-off installed flush toilets, while the poor relied on basic amenities. When people complained about declining living conditions, the politicians didn't listen. When evidence of the biological contamination of local water sources was presented, the politicians tried to undermine it. Over time, horse dung on the streets and human waste in cesspits flowed into the capital city's largest river, the source of drinking water, choking it of oxygen. Still, calls for change went unanswered until the political elites literally faced a summer stench at their doorsteps, and the death toll from cholera reached into the thousands. Only then did they act, making major investments in sanitation and water supply infrastructure and institutions. The Great Stink was a watershed moment for London.

The Sustainable Development Goals (SDGs) and the World Bank's corporate goals of ending extreme poverty and boosting shared prosperity call for specific attention to the poor and vulnerable. The overarching objective of the SDGs is to end poverty in all its forms, but their key difference from the earlier Millennium Development Goals (MDGs) is the integration of social, economic, and environmental goals (UN 2015). This has significant implications for reforms aimed at improving service delivery. With this understanding as its guiding compass, the Water Supply, Sanitation, and Hygiene (WASH) Poverty Diagnostic Initiative focuses on what it would take to reduce existing inequalities in WASH services worldwide.

This report, a synthesis of that global initiative, offers new insights on how data can be used to inform allocation decisions to reduce inequalities and prioritize investment in WASH to boost human capital. It also offers a fresh perspective on service delivery that considers how institutional arrangements[1] affect the incentives of a range of actors. When it comes to improving services, politics matters as much today as it did in the London of the mid-19th century.

Importantly, as will be discussed below, the report does not offer prescriptive global solutions for service delivery challenges. Instead, it seeks to encourage a dialogue on ways to think and work differently, using a problem-driven approach and engaging with the constraints imposed by the broader governance environment.

The Time for Action Is Now

The importance of water supply, sanitation, and hygiene obviously transcends time and geography—but even where this is explicitly recognized in policy, the needs of hundreds of millions of citizens remain unmet.[2] In particular, renewed efforts are needed to address those populations at greatest risk of death and disease due to inadequate WASH, which threatens human capital and economic development.

The SDGs set ambitious new targets for WASH: universal access to safe and affordable services by 2030.[3] The SDGs raise the bar by aiming not only to expand access to basic WASH services

but also to close gaps in service quality, with an eye toward long-term sustainability. This means not only providing water in people's homes, but also making sure that the water is safe to drink and continuously available. It means not just constructing more sanitation facilities, but making sure, year after year, that these are used and human waste is properly removed, treated, and disposed of—in all neighborhoods, not just the wealthiest. Beyond their intrinsic value, improved WASH services will ensure the achievement of other development goals. For instance, SDG 3, focused on overall health, includes targets that explicitly relate to improvements in WASH. In their comprehensiveness, the SDGs open the difficult and yet unanswered questions of where to start making improvements, how to prioritize action, and how to overcome existing bottlenecks.

Countries that have struggled to reach the MDGs for WASH[4] will likely need to improve efficiency and invest even more to reach the SDGs. The fourfold increase in investments that is likely needed to meet the SDGs is beyond what most governments can afford (Hutton and Varughese 2016)[5]. Hence, private capital for infrastructure investment will become increasingly important for services, such as urban water supply, where cost-recovery, at least for operations and maintenance, is more feasible. And given that resources, whether public or private, will always be finite, increasing the *efficiency* of investments will be as important as how and where investments are made. In some cases, achieving greater efficiency will mean confronting political obstacles. Often, policy documents say the right things about investing in water supply and sanitation to benefit poor and vulnerable populations, but implementation by governments and donors does not reflect these commitments.

Many countries struggle to maintain current infrastructure, let alone respond to growing demand. In densely populated areas, economies of scale can be achieved by providing piped water rather than leaving individual households to rely on their own sources, such as wells. Providing piped water also allows groundwater, a public good, to be better regulated and controlled against pollution and overabstraction. Surprisingly, this report reveals that the public provision of piped water on household premises is declining as countries struggle to keep up with population growth. In *Nigeria*, it fell from 29 percent in urban areas in 1990 to less than 10 percent by 2015. Similarly, in the *Democratic Republic of Congo*, piped connections dropped from 48 percent of the urban population in 1990 to only 17 percent in 2015. *Haiti*, *Tanzania*, and the *West Bank and Gaza* also suffered a decline in urban areas during this period. In the face of service delivery failures, households take matters into their own hands, sinking private wells if they can afford to (and thereby straining the local aquifer) or buying from unregulated private providers that charge three to four times what public providers do.

In some countries, piped water is hardly any safer than pond water and is a threat to people's health. The SDGs call for safely managed water, which means that improved water is located on premises, available when needed, and free of biological and chemical contamination. Figure ES.1 presents data on *E. coli* contamination in four countries—*Bangladesh*, *Ethiopia*, *Tajikistan*, and *Ecuador*.[6] Contamination levels vary dramatically not only by country, but also by location and household wealth. The figure also reveals a surprising fact about piped water, which is theoretically the safest source: in some locations, it is equally or more contaminated than nonpiped supply.

In Bangladesh, 80 percent of piped water is contaminated with *E. coli*, a level that is just as contaminated as surface water. Reasons for this could be inadequate treatment at the source, and/or the intermittent water supply, whereby porous networks increase the risk of contaminants being drawn in. Giving citizens more information about this problem—making the invisible visible—will be critical for improving accountability of service providers. Improving accountability involves not only giving citizens information, but also creating space to act on that information so that service providers and/or governments have incentives to respond. Thus, it is critical to promote household water treatment in areas where the improvement of infrastructure and service will take time.

Figure ES.1: *E. coli* Contamination Rates at Water Sources
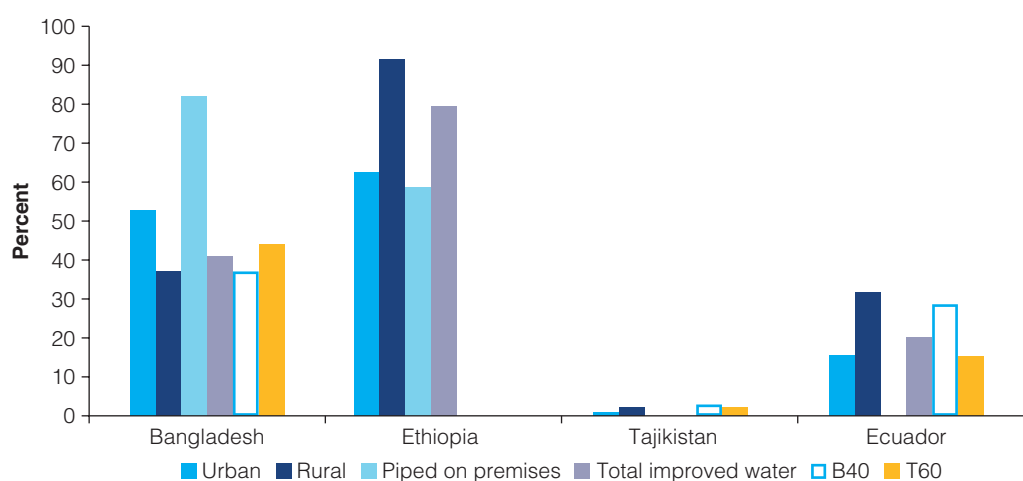
Source: World Bank calculations.

Problem-Driven Diagnostics to Guide the Way Forward

Built on in-depth country-level analysis, the WASH Poverty Diagnostic Initiative aims to provide data-driven recommendations to help policy makers, stakeholders, and donors plan more strategically and equitably. The present report synthesizes multisectoral research from 17 low- and middle-income countries[7] and the West Bank and Gaza, undertaken since 2015. It presents new evidence on inequalities in access to WASH services, examines the impact of unequal services on the poor, and explores context-specific constraints that go beyond technical issues to understand why service delivery continues to be inadequate and inefficient. It highlights findings from individual countries, involves substantial reanalysis of existing data sets in new and innovative ways, brings new evidence on spatial inequalities at the subnational level, and shares insights on SDG parameters that were previously invisible. The work confirms some prior findings, even as it challenges water sector practitioners and decision makers to do business differently.

The report is not prescriptive about how governments should spend their resources—such decisions are the domain of autonomous states, based on local needs, resources, and conditions. Rather, it offers insights on how to better use available information to prioritize and inform investment decisions. The report also does not offer prescriptions for addressing identified constraints but suggests an approach to finding solutions. One of the key learnings from the initiative is that there are no universal off-the-shelf solutions. Not only do politics, institutional arrangements, and norms vary across countries, but so do the different services within the WASH sector. The characteristics of urban water/sanitation and rural water/sanitation differ considerably in terms of their constituencies and the roles of state and private actors, and therefore attract varying degrees of political attention, suggesting diverse strategies to improve performance.

To find solutions that will work within a given context, specific service delivery problem(s) may be used as the starting point for a diagnostic aimed at identifying binding constraints. The next step is to work with local stakeholders to debate and contest issues and solutions that are context specific and fit with local politics and the existing policy environment. This can open the

ambit of reform options that are needed to improve services. (While the desk-based country analysis conducted under the WASH Poverty Diagnostic Initiative highlights why such an engagement process is required, the process itself is beyond its scope.)

The lessons from the Initiative point to the need to *think and work differently*—**business as usual is not an option.** Specifically, three broad shifts in thinking are needed to accelerate progress toward the SDGs' vision for water and sanitation:

- **Investments and interventions need to be coordinated across sectors to improve human development outcomes.**

- **Future investments need to be better targeted and efficiently allocated, given that most countries have limited fiscal space.**

- **A better understanding of the broader governance context within which WASH services are delivered is needed to reduce gaps between policy and implementation.**

All Hands on Deck: Working Together to Protect the Foundations of Development

Regardless of their income level, all countries included in the WASH Poverty Diagnostic Initiative—and indeed most of the countries in the world—face multiple and competing challenges and priorities. In poor countries, poverty cuts across multiple dimensions, WASH being one of them. In fact, the lack of WASH services typically constitutes one of the deepest and most far-reaching deprivations. With this in mind, this study highlights how improving WASH can help protect the foundations of development by supporting nutrition (addressed by SDG 2) and health (addressed by SDG 3), two key pillars of human development.

In several countries studied here, a silent emergency is putting vulnerable sections of the population at risk for nutritional deficiency and diarrheal disease. In *Guatemala*, *Niger*, *the Democratic Republic of Congo*, *Mozambique*, *Yemen,* and *Bangladesh* the rate of stunting[8] among children under 5 is over 40 percent. Stunting is a powerful risk factor associated with 53 percent of infectious-disease-related deaths in developing countries. The undernutrition from which it results can have long-lasting negative effects on children: poor mental development, behavioral abnormalities, and a reduced capacity to work, among others. These disadvantages are detrimental to human capital and to economic development more generally. A growing literature shows how poor WASH contributes to undernutrition by transmitting pathogens and infections that inhibit nutritional uptake.

Directing WASH investment toward public health objectives can help reduce childhood diarrheal disease and undernutrition—and, for this, geospatial mapping data are key. Although the correlation between monetary poverty and children's health is clear enough at the country level, it does not map directly to poor/non-poor or rural/urban categories. Not all children in poor households or in rural areas are undernourished or suffering from diarrheal disease, and not all children in relatively wealthy or urban households eat well and are free from diarrheal disease. While it is a fact that children living in the five largest slums of Bangladesh have the highest rate of stunting in the country (nearly 50 percent), children in relatively well-off households are also at risk. Among the better off, those exposed to drinking water contaminated with *E. coli* are at higher risk than those who are not exposed to such water. The research conducted under the WASH Poverty Diagnostic Initiative demonstrates that WASH investments targeted at areas or groups whose risk of diarrhea and stunting is high are likely to accomplish *more* in improving overall human development outcomes than efforts to achieve universal coverage by reducing the WASH gaps between poor and rich, rural and urban.

An effort to improve WASH, coordinated with other health interventions, can have effects greater than the sum of its parts. Using a conceptual framework from the United Nations Children's Fund (UNICEF) as a guide, the analysis highlights the need to look across the determinants of poor health indicators, such as stunting, to understand the overlapping deprivations of a child. UNICEF identifies four determinants of stunting: a lack of (i) food security, (ii) adequate personal care and feeding, (iii) a healthy environment (that is, WASH), and (iv) adequate health-care services. The Initiative considers whether synergies are generated when more than one of these basic human needs are met. As outlined in this report, stunting can be reduced to a greater degree when children are given simultaneous access to *both* adequate WASH and specific health services than when they gain access to only WASH or only health services.

A combination of WASH-related risk factors increases the likelihood of childhood death from diarrheal disease.[9] The Initiative developed a risk model to assess the co-distribution of risk factors for child mortality from diarrheal disease—one of the most important being poor water supply and sanitation. Understanding where the risk of diarrheal mortality rates is highest also means understanding where children lack access to Vitamin A, are underweight for their age, and lack access to oral rehydration therapy (ORT). The combination of these risk factors determines a child's overall risk of dying from diarrheal disease (figure ES. 2).

WASH investments will have the greatest impact on childhood mortality due to diarrheal disease when they target geographic areas where populations have little access to services plus other vulnerabilities. One of the main benefits of the risk model that the WASH Poverty Diagnostic Initiative developed is its quantification of overall disease risk—and variations in this risk across subnational and income-level divisions.

Map ES.1 highlights the spatial distribution of the exposure index associated with inadequate WASH and the susceptibility index of the factors that amplify or weaken the impacts of inadequate WASH in *Mozambique.* A high value of the exposure index (the blue map) implies poor WASH, while a high value of the susceptibility index (green map) implies high vulnerability (that is, lack of access to Vitamin A and ORT and being underweight). The risk index (red) is a combination of the exposure and susceptibility indices and highlights the provinces where

Figure ES.2: Risk Factors of Diarrheal Mortality: Exposure and Susceptibility
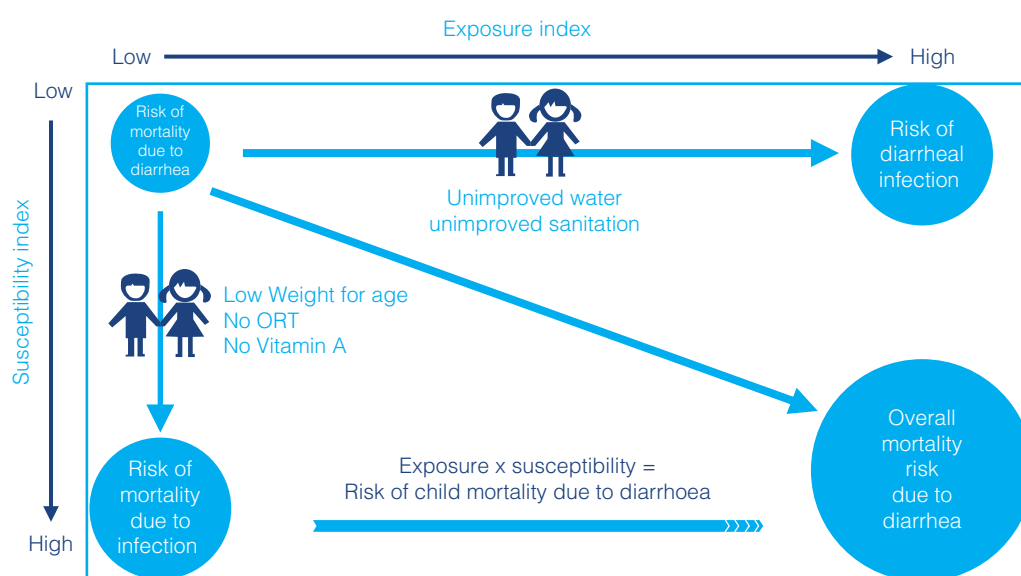
Source: Cumming et al., forthcoming and appendix B.
Note: ORT = oral rehydration therapy.

Map ES.1: Exposure to Inadequate WASH and Susceptibility Factors Combined Increase Risk of Child Mortality Due to Diarrhea in Mozambique

Exposure index

Overall

	<2.4
	2.4–2.6
	2.6–2.8
	>2.8

Susceptibility index

Overall

	<0.5
	0.5–1.0
	1.0–1.5
	>1.5

Risk index

Overall

Cabo
Delgado

Tete

Nampula

Zambezia

	<1.0
	1.0–2.0
	2.0–3.0
	3.0–4.0
	>4.0
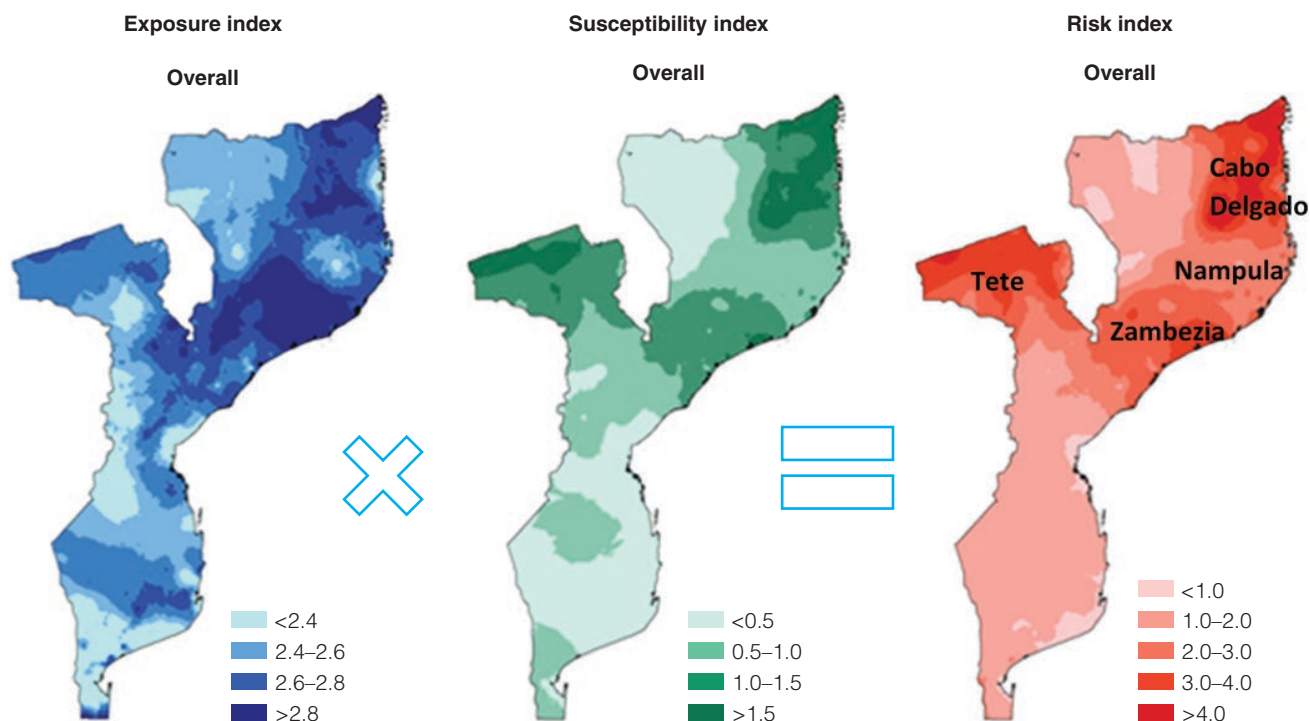
Source: World Bank 2017b.

children are most at risk of dying from diarrheal disease. This and other findings reveal that geographic targeting based simply on poor WASH services (high exposure index) may not be the most effective in terms of reducing diarrhea.

Investments: More and Better Targeted

Significant disparities in WASH quality are associated with differences in wealth level, location, and other demographic characteristics. Specifically, the quality of WASH facilities and services differ between the poor and non-poor, between rural and urban areas, between large cities and small cities, and across and within geographic regions of the same country. Traditionally disadvantaged groups—including women, the indigenous, and the disabled—suffer an additional burden. In some pockets of both rural and urban areas, this burden poses a dire threat to basic health. The WASH Poverty Diagnostic Initiative provides decision makers with more precise information about such inequalities so they can act to better allocate their resources.

Rural areas are particularly lagging: in the countries analyzed, three out of four people who lack improved sanitation and four out of five people who don't have improved water live in rural areas. Of the estimated 2.4 billion people in these 18 economies, 1.5 billion (63 percent) live in rural areas. The poor are disproportionately affected by this lag: approximately 74 percent live in rural areas.[10] Meanwhile, a lack of attention to sanitation and the management of human waste is causing problems in both urban and rural areas. Sanitation-related disease is increasingly a concern in densely populated areas; the urban poor are two to three times less likely to access any type of improved sanitation than their better-off neighbors.[11] To assist decision makers in achieving the policy objectives of equitable access, the WASH Poverty Diagnostic Initiative provides new methods to inform resource allocation.

Map ES.2 shows the overlay of income poverty and improved sanitation and their spatial distribution in *Nigeria.* This reveals that the relationship between poverty levels and access to improved sanitation is not straightforward. Around 22 percent of Nigerians are in low-poverty areas and have low levels of access to improved sanitation, and around 10 percent of Nigerians are in high-poverty areas and have high access to improved sanitation. This type of information can help decision makers identify areas where it may be prudent to employ subsidies due to low income levels, and provides a guide to better understand why some geographic areas do better than others despite a high degree of poverty.

Discrepancies between policies and budget allocations are compounded by inefficient execution and implementation. Policies and voted budgets often look "good" in terms of their commitments to extend WASH services to poor and marginalized populations, but the actual resource allocation decisions do not reflect the policy commitments. While there are no standard objective criteria for judging whether policies are "good" or "bad," for the purposes of this initiative policies are assessed from the perspective of providing affordable, sustainable, and equitable services to the poor and marginalized groups.

For example, the policy in *Niger* (PROHESA 2016-30) clearly articulates the state's commitment to ensuring equal access to WASH services, and their affordability, and would, by this yardstick, be considered "good." While the rate of access to improved water in urban areas stands at 100 percent, in rural parts of the same country only 1 percent of people have access to improved sanitation. While those living in cities saw their access to improved water increase by 39 percentage points between 1990 and 2015, open defecation increased in poor rural areas. These statistics are difficult to ignore given that 75 percent

Map ES.2: Poverty and Access to Improved Sanitation in Nigeria

Poverty	Access to improved sanitation	
Low		Low
Low		High
High		Low
High		High
Admin boundaries		
	States	

0 25 50   100 Miles
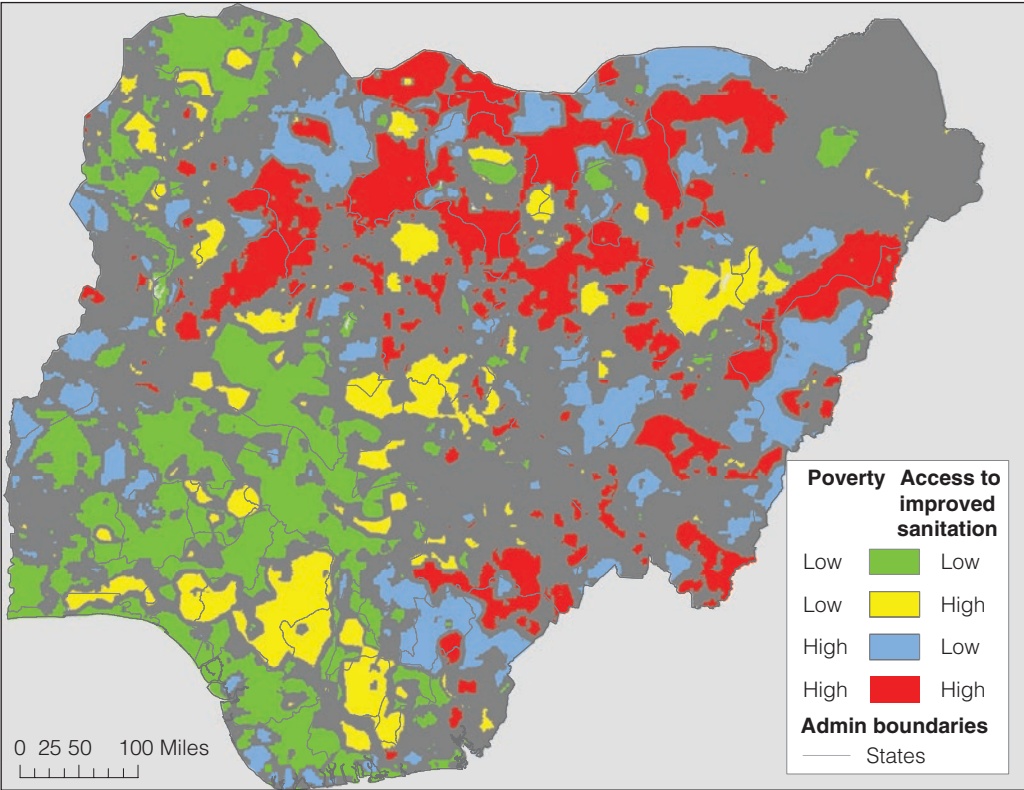
Source: World Bank 2017c.

of residents live in rural areas, as do 90 percent of the poor, who are largely concentrated along the country's southern border.

While this report does not prescribe how governments should spend their resources, if countries and donors truly aspire to attain the SGDs then they will need to *invest more* in WASH and plan carefully to make *more effective* use of the resources available to them.

Mind the Gap: From Policy to Pipes

The failure to provide adequate WASH services to the poor and other marginalized groups results primarily from poor implementation rather than bad policy. For example, in Tanzania the water budget quadrupled in the span of just 12 years (2002–14), due in large part to enhanced coordination and commitments by donors to achieve the MDG for water. Donor support encouraged the country to adopt reforms aimed at devolving resources and authority to local governments and encouraging community participation in operations and management— widely endorsed measures meant to enhance sustainability and promote equity. However, as of 2015, access to basic water services had stagnated at just over 50 percent of the population. In addition, 40 percent of all water points[12] in rural areas are not functional and an estimated 25 percent of all water points in the country break down within two years of construction.

The WASH sector is characterized by persistent failures in providing sustainable services to vulnerable populations—even when the funding to do so is available. This tendency is revealed again in the case of *Tanzania*, but its experience is not unique. Similar situations abound in most of the World Bank's client countries. In addition to the resource allocation issues discussed previously, the kinds of service delivery challenges described in Tanzania point to the critical importance of enhancing the *efficiency of resource use.* There is a need to look beyond technical issues, and even challenge or revisit "best practice" approaches that have been promoted over the years. Improving the efficiency of resources will require sector practitioners to look beyond infrastructure and services and pay more attention to the institutional arrangements and the distribution of power that influences how these institutions perform in practice.

Looking across a subset of 10 economies studied under the WASH Poverty Diagnostic Initiative,[13] a set of common themes emerge. First, we see that information asymmetries and a lack of transparency frequently make it difficult for citizens to know what they can reasonably expect and demand from service providers and politicians. Such a lack of information is compounded by constraints on the ability of those without significant wealth to effectively voice their concerns. As a result, the visibility of outputs tends to drive the priorities of policy implementation. Among other things, this creates incentives to construct new infrastructure, rather than invest in the operation and maintenance of existing infrastructure or focus on improvements to water quality.

The fact that water and sanitation services have been only partially decentralized in many of the cases also creates challenges for implementation. Several country cases reveal a lack of clarity in the allocation of responsibilities and poor coordination across different implementing agencies. This results in local governments failing to adequately discharge the responsibilities assigned to them. This is frequently the result of a transfer of responsibilities to the local level without a commensurate transfer/availability of financial and human resources. The failure to sufficiently resource local governments is frequently political—reflecting a reluctance on the part of the central government to meaningfully share power, an outcome of intergovernmental interactions within what the 2017 *World Development Report* calls the "policy arena" (World Bank 2017a). Thus, in addition to the cross-government coordination discussed above, there are efficiency gains that can be had from improving coordination across levels/tiers of government.

Critically, the identification of common constraints does not justify the application of common solutions. A problem-driven approach is necessarily context driven, and—perhaps frustratingly— means that would-be reformers cannot begin with a prepackaged toolkit of tried-and-tested

reforms. Rather, the proposed approach necessitates beginning with a well-identified service delivery problem and identifying the broader governance context within which it manifests. Political economy analysis can help to identify the relevant actors whose incentives can potentially be shifted to facilitate more efficient and equitable outcomes. Instead of trying to rework the whole operating environment, the goal is to navigate it, while being cognizant of political and technical constraints.

Looking Toward the Sustainable Development Goals

The Initiative points to the importance of thinking (and working) differently, not only about inequality in WASH services, but also about how investment in WASH can have added impact on human development outcomes. It draws from all possible data sources, contributing new ones (notably in relation to water quality) to triangulate the analysis and objectively ascertain the facts and proposed recommendations. The lessons from this initiative highlight the following:

- If policy objectives are to reduce inequities in human development outcomes with WASH investment, then going at it alone and taking a spatially blind approach will not do. Coordinated efforts that consider investment in health services and nutrition investment are critical. These can also help reinforce cross-sectoral coordination more broadly in efforts to reduce undernutrition, stunting, and morbidity and mortality due to diarrheal disease.

- To reduce inequalities in WASH services between more and less vulnerable groups, resources need to be targeted in a more efficient manner; the Initiative offers a compass for achieving those policy objectives.

- To strengthen institutions and improve efficiencies, there is a need to look at the broader governance environment to understand binding constraints beyond technical issues specific to the WASH sector.

- More money is required, but investing more money in inefficient institutions will not always result in better outcomes; improving efficiencies and strengthening institutions is paramount.

- Harmonizing and improving data collection efforts at the country level will be critical to monitoring the SDG indicators. This means more consistency across national surveys, but also better use of administrative data. Making information such as water quality available to the public can reduce information asymmetries.

The lessons from 1850s' London resonate today: politics matter when developing policies and allocating and spending resources. The tasks that countries and donor institutions must consider as they look ahead at the SDGs may be considered herculean. They need not be undertaken alone. A key reflection from this initiative is that building cross-sectoral collaborations among water, poverty, health, and governance specialists brings a diverse range of perspectives and new insights, and opens up the possibility to think and work differently. This report hopes to inspire decision makers and practitioners to do just that for goals to be more than words, with tangible benefits for the most vulnerable.

Notes

1. Institutions are the "humanly devised constraints that shape human interaction" (more commonly referred to as the "rules of the game") and organizations are "groups of

individuals bound by some common purpose to achieve objectives" (North 1990). Combined, the two constitute the "institutional arrangements," or governance environment, observed in a particular area. Intergovernmental arrangements, regulations, and such compose the "institutional architecture."

2. As of 2015, 663 million people lacked access to improved drinking water (http://www.who.int/water_sanitation_health/monitoring/jmp-2015-key-facts/en/).

3. It is important to note that these are global aspirational targets and that countries are expected to customize and adapt them to the local context.

4. According to the Joint Monitoring Programme of the World Health Organization and the United Nations Children's Fund (WHO/UNICEF) (JMP 2015), 147 countries met the drinking water goals and 95 countries met the sanitation goals, but only 77 countries met both.

5. The unit costs on which these estimates are based implicitly include prevailing inefficiency. Costs would be lower if these inefficiencies are reduced.

6. In the Democratic Republic of Congo, not included in this figure, *E. coli* contamination is common across improved (piped and nonpiped) and unimproved sources; is high in the capital, Kinshasa; and near-universal in rural areas.

7. Indonesia, Bangladesh, India, Pakistan, Tajikistan, Yemen, Tunisia, Ethiopia, Tanzania, Mozambique, the Democratic Republic of Congo, Nigeria, Niger, Haiti, Guatemala, Panama, and Ecuador. Criteria such as income status, income inequality, regional representation, state fragility, WASH coverage, data availability, and ability to inform the World Bank's Systematic Country Diagnostic were considered in the selection process. Final decisions were based on demand from World Bank country offices. Thus, the selected countries are not a representative sample of the regions of the world, but they do include a mix of low-income, fragile, and middle-income economies. Individual country reports prepared under the WASH Poverty Diagnostic Initiative can be accessed at www.worldbank.org/washpdinitiative.

8. The World Health Organization (WHO) defines stunting as a height-for-age value less than two standard deviations from the WHO-defined median.

9. It is worth noting that there are numerous other benefits that extend beyond health.

10. This estimate is based on the distribution of the poor in each country using national poverty lines. The rural share of the poor ranges from 54 percent in Tunisia to 93 percent in Mozambique.

11. This estimate is based on urban income quintiles in the Sub-Saharan African and South Asian countries that were part of this study.

12. That is, the point sources that account for most water supply infrastructure in rural areas in many developing countries. These include communal standpipes, hand pumps, and improved springs.

13. Bangladesh, Ethiopia, Guatemala, Indonesia, Mozambique, Niger, Nigeria, Panama, Tanzania, and the West Bank and Gaza.

References

Hutton, G., and M. Varughese. 2016. "The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene." Technical Paper, Water and Sanitation Program (WSP), World Bank, Washington, DC.

North, D. C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge, United Kingdom: Cambridge University Press.

Cumming, O., R. Rheingans, J. Anderson, K. Bagamian, L. Andres, C. Kullman, E. Skoufias, and S. Ryan. Forthcoming. *Estimating the Distribution of the Water and Sanitation Attributable Enteric Disease Burden in Seven Low Income High Burden Countries—The Application and Validation of a Novel Quantitative Risk Assessment Model*.

UN (United Nations). 2015. "Transforming our World: The 2030 Agenda for Sustainable Development." Resolution adopted by the General Assembly on 25 September 2015. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

WHO/UNICEF JMP (Joint Monitoring Programme). 2015. "Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment." JMP, WHO and UNICEF, Geneva.

World Bank. 2017a. *World Development Report 2017: Governance and the Law*. Washington, DC: World Bank.

———. 2017b. *Findings of the Mozambique Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. World Bank, Washington, DC.

———. 2017c. *A Wake Up Call: Nigeria Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. World Bank, Washington, DC.

Chapter 1
A New Era of Service Delivery: Preparing to Meet the Sustainable Development Goals

In 2013, the World Bank announced two challenging goals for its daily operations, country engagement, and analytical work: (i) ending extreme poverty and (ii) boosting shared prosperity. While these twin corporate goals are measured in terms of income, the spirit behind them extends to the overall *well-being* of those on the lower end of overall wealth distribution. Many such people are poor not only in cash terms, but also in terms of their level of access to basic public services.

The Sustainable Development Goals (SDGs) formally adopted in 2015 are unambiguous in their call for universal access to water and sanitation services. **Goal #6**, *"Ensure access to water and sanitation for all,"* and **Goal #3**, *"Ensure healthy lives and promote well-being for all at all ages,"* provide a clear vision for progressively eliminating inequalities in access to basic services and reducing poverty.[1]

These goals put equity front and center in ways that are both positive and normative. Typically, better-off households have better access to basic services such as water supply, sanitation, health care, and education. These services allow children in these households to live healthier lives and to accumulate more human capital than children from disadvantaged backgrounds, thus contributing to future inequities in well-being. A lack of access to good-quality services early in life fosters the intergenerational transmission of poverty, otherwise known as the "poverty trap."[2]

In light of the World Bank's twin goals and the SDGs, the World Bank's Water Global Practice launched the Water Supply, Sanitation, and Hygiene (WASH) Poverty Diagnostic Initiative to shine a light on service delivery to the poor and vulnerable. Specifically, the initiative undertook research to better understand the impacts of inadequate services and identify the binding constraints to service delivery. This initiative considers the new standards of the SDGs, which raise the bar (above that set by the Millennium Development Goals, MDGs) by not just aiming for universal access to basic WASH services, but also attempting to close the gaps in service quality, with an eye toward long-term sustainability. This means not only providing water in people's homes, but also making sure that the water that flows from the taps is safe to drink and continuously accessible and available. It means not just constructing more sanitation facilities, but making sure that human waste is properly removed, treated, and disposed of—and in all neighborhoods, not just the wealthiest. It means institutions working efficiently and effectively to deliver services. The revised standards of the SDGs translate into higher capital and operating costs—at least a fourfold increase in capital spending over what was required to reach the MDGs for water and sanitation. Yet many countries struggled to meet even those relatively modest targets with the resources that were available.

This raises several questions: What will it take to achieve the SDGs—particularly for those countries that failed to meet the MDGs? Do the binding constraints lie in policy or its implementation? Even if more resources become available, will these result in the desired outcomes? How can WASH investment be better targeted to close service gaps and reduce inequities in health outcomes? This report engages with these questions and sheds light on emerging answers to them.

The Water Supply, Sanitation, and Hygiene (WASH) Poverty Diagnostic Initiative

The Initiative was launched in 2015 to better understand trends in access to WASH services, the impacts of unequal service provision on the poor, and the reasons why service delivery continues to be inadequate and inefficient. Based on its analysis of these factors, the diagnostic seeks to provide evidence on the state of WASH inequality around the world, and attempts to understand why differences in access rates persist.

There are no simple answers or one-size-fits-all explanations for these complex problems, let alone solutions. Hence, solutions will need to be individually tailored to every context. In recognition of this, the WASH Poverty Diagnostic Initiative took a multisectoral and problem-driven approach.[3] At the Initiative's core are four questions that guided research and fieldwork across 17 countries[4] (that range from middle-income to low-income to fragile and conflict affected) and the West Bank and Gaza. These questions are as follows:

1. **Who and where are the poor and vulnerable populations?**

2. **What is their level of access to WASH services, and of what quality, relative to the better-off segments of society?**

3. **What are the links and synergies between WASH and other sectors?**

4. **What are the binding constraints on improving service delivery, and how can these be addressed?**

Why these four questions? In short, they call for a comprehensive and robust evidence base, at the country level, that can be used to guide policy and programs both local and global. The robust evidence generated under this initiative and the approaches that it advocates will help policy makers, implementing agencies, and donors understand with a new level of precision who and where the most vulnerable in society are located and how to best serve them. This, in turn, can help them better allocate, prioritize, and coordinate resources to meet their policy objectives and improve human development outcomes.

In so doing, the initiative highlights binding constraints that, to be addressed, require further engagement and research. While the Initiative aspired to identify solutions to constraints in service delivery, this ultimately was beyond its scope. In general, the initiative found that improving the efficiency of public resources at scale requires sector practitioners to look beyond infrastructure and services and pay more attention to the institutional arrangements and the distributions of power that influence how these institutions perform in practice. Such an approach suggests shifting from a focus on "best practices" to a context-specific "best fit" that "works with the grain"[5] of the prevailing political context. Any reforms implemented using this approach are likely to be incremental and feasible. Instead of trying to rework the whole operating environment, the goal is to navigate it, while cognizant of political and technical constraints. This report advocates this approach because the politics, institutional arrangements, societal norms, and even the characteristics of water and sanitation services differ by nation and locale.

From the Millennium Development Goals to the Sustainable Development Goals

The MDGs distinguished between "improved" and "unimproved" water and sanitation services. Today, the SDGs propose a more ambitious vision for service delivery, using new indicators that are more refined and stringent. The baseline estimates developed by the Joint Monitoring Programme (JMP) for Water Supply and Sanitation[6] provide a stark picture of the challenges

and opportunities over the next 15 years: 4.5 billion people lack access to safely managed sanitation, and 2.1 billion to safely managed water.[7] This report focuses on three SDG targets:[8]

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

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

- By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.[9]

This report provides a picture of the implications of shifting from the MDGs to the SDGs. In 2016, Hutton and Varughese estimated that $28 billion a year would be needed to provide the unserved with just basic services (MDG standards), and estimates run well over a $100 billion a year to provide safely managed services (SDG standards) for all. This report acknowledges that while more money is required to reach the new targets, it is even more critical that *effectiveness* and *efficiency* in the allocation and the use of resources be prioritized. Focusing on these priorities would improve targeting and reduce the waste of scarce public resources.

Table 1.1 provides an overview of the ladder-like progression of quality levels for water and sanitation services that the JMP will monitor. The top level of quality for water supply and sanitation is "safely managed."

The United Nations (UN) Member States agreed to raise standards by committing to the SDGs. This in itself is an acknowledgement that the previous standards were not sufficient to ensure that assets were fully delivering the social or public good benefits intended. For example, under the MDGs a household could still be considered to have access to improved drinking water even if it took over an hour to obtain, decreasing the volume of water consumed and increasing the risk of contamination during transport. Where piped supply is intermittent, the risk of water becoming contaminated increases greatly. A toilet with a slab may adequately protect users from contact with human feces, but what happens when a latrine or septic tank fills up? And what if sewage is left untreated? The SDGs attempt to comprehensively close existing gaps in access to basic services, and to ensure that improvements are sustained over the long term.

Whenever standards are raised, some countries will struggle more than others to achieve them. This is most definitely the case of the new SDG targets 6.1, 6.2, and 6.3, which have different implications for different countries. While some countries may need to simply increase efficiency by some modest amount, others will face significant challenges and will most likely need to take an incremental approach to meeting these targets.

Figure 1.1 provides a snapshot of how coverage rates will change across 17 of the WASH Poverty Diagnostic countries as each of the SDG parameters is applied. Specifically, it compares *Ethiopia*, the 17-country average, and *Ecuador*.[10] While coverage will decline across all countries, it will do so to varying degrees. Also, countries that do not collect data on the parameters of the new SDG baseline, "safely managed," will find it particularly difficult to even consider how best to address the comprehensive WASH needs of their citizens, or to demonstrate any progress they do make toward the 2030 goal of universal access.

Water quality and the continuity of water supply appear to be key drivers that lower the baselines for safely managed water (where data are available). For instance, while *Ecuador* and *Bangladesh* have achieved their MDGs for water, the new SDG standards have recalibrated their baselines down by 22 and 44 percentage points, respectively, largely due to water quality issues. Moreover, piped water on household premises was found to be equally or more contaminated

Table 1.1: Progressing Up the WASH Ladder: Levels of Quality of Water Supply, Sanitation, and Hygiene

a. Water			b. Sanitation			c. Hygiene	
MDG/SDG	Water service ladder	Progressive realization	MDG/SDG	Sanitation service ladder	Progressive realization	Handwashing ladder	
SDG 6.1	Safely managed	Drinking water from an improved water source which is located on premises, available when needed and free of faecal and priority contamination	SDG 6.2	Safely managed	Use of an improved sanitation facility which is not shared with other households and where excreta are safely disposed in situ or transported and treated off-site	Basic	Handwashing facility with soap and water in the household
MDGs	Basic	Drinking water from an improved source provided collection time is not more than 30 minutes for a roundtrip including queuing	MDGs	Basic	Use of improved facilities which are not shared with other households		
	Limited	Drinking water from an improved source where collection time exceeds over 30 minutes for a roundtrip to collect water, including queuing		Limited	Use of improved facilities shared between two or more households	Limited	Handwashing facility without soap or water
	Unimproved	Drinking water from an unprotected dug well or unprotected spring		Unimproved	Use of pit latrines without a slab or platform, hanging latrines and bucket latrines	No facility	No handwashing facility
	Surface water	Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation channel		Open defecation	Disposal of human faeces in fields, forest, bushes, open bodies of water, beaches or other open spaces or with solid waste		

Source: Joint Monitoring Programme.
Note: MDGs = Millennium Development Goals; SDGs = Sustainable Development Goals.

Figure 1.1: "Safely Managed" Standards Imply Lower Coverage Rates—But to a Different Degree in Each Country
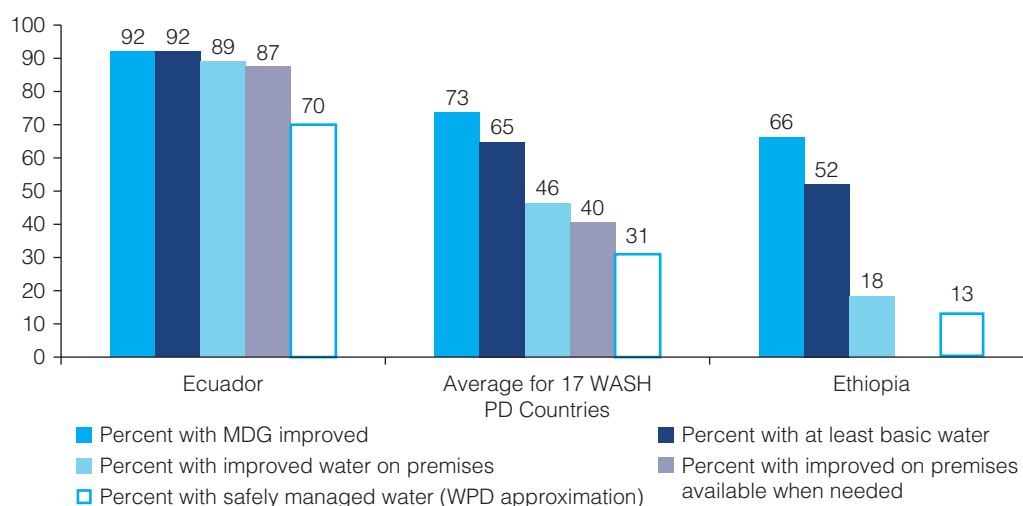
Source: World Bank calculations based on the most comprehensive and latest available data for each country.
Note: Each consecutive category adds a stricter criterion, hence it is expected to be lower than what precedes. Notably, "safely managed" adds the criterion that the source be "free of contamination." Because of data availability, the number of countries used to calculate the average varies: 17 countries for MDG improved, 16 for basic, 16 for improved on premises, 9 for available when needed, and 6 for safely managed.

with *E. coli* than improved off-site water sources in **Bangladesh** and the **Democratic Republic of Congo**. On the other hand, accessibility (that is, improved services on premises) will continue to pose a challenge for low-income countries such as **Ethiopia**, the **Democratic Republic of Congo**, **Tanzania**, and **Niger**, which struggled to meet the MDGs. The SDG indicators push these countries' baselines (which were already low under the MDGs) down by over 44 percentage points. This reinforces the importance of taking the ladder approach adopted by the JMP (see table 1.1) to help countries track incremental progress toward universal access to safely managed drinking water and sanitation. Quality of service is further discussed in chapter 2.

Country Selection and Methodology

The 18 economies studied under the Initiative are located in six regions of the world (see map 1.1).[11] They are not a globally representative sample but do include a mix of low-income, fragile, and middle-income economies.

The WASH Poverty Diagnostic Initiative systematically developed and applied various methods across countries to understand inequalities in service provision, outcomes of such inequities, and binding constraints on service delivery. Through desk research, the initiative explored existing country literature on health, WASH, and service delivery, and also conducted primary data collection and qualitative field work. (For a more detailed description of methods and reference to background papers, see appendix A.)

The Value of the WASH Poverty Diagnostic Initiative

The Initiative examines inequality across four "domains": poverty, location, social identity, and time. It is essential to engage with inequalities across these different domains to better

Map 1.1: The 18 Economies Studied by the WASH Poverty Diagnostic Initiative

Europe & Central Asia
• Tajikistan

Middle East & North Africa
• West Bank & Gaza
• Yemen, Rep.
• Tunisia

East Asia & Pacific
• Indonesia

South Asia
• Bangladesh
• Pakistan
• India

Africa
• Mozambique
• Tanzania
• Ethiopia
• Nigeria
• Niger
• Congo, Dem. Rep.

Latin America & Caribbean
• Haiti
• Guatemala
• Ecuador
• Panama

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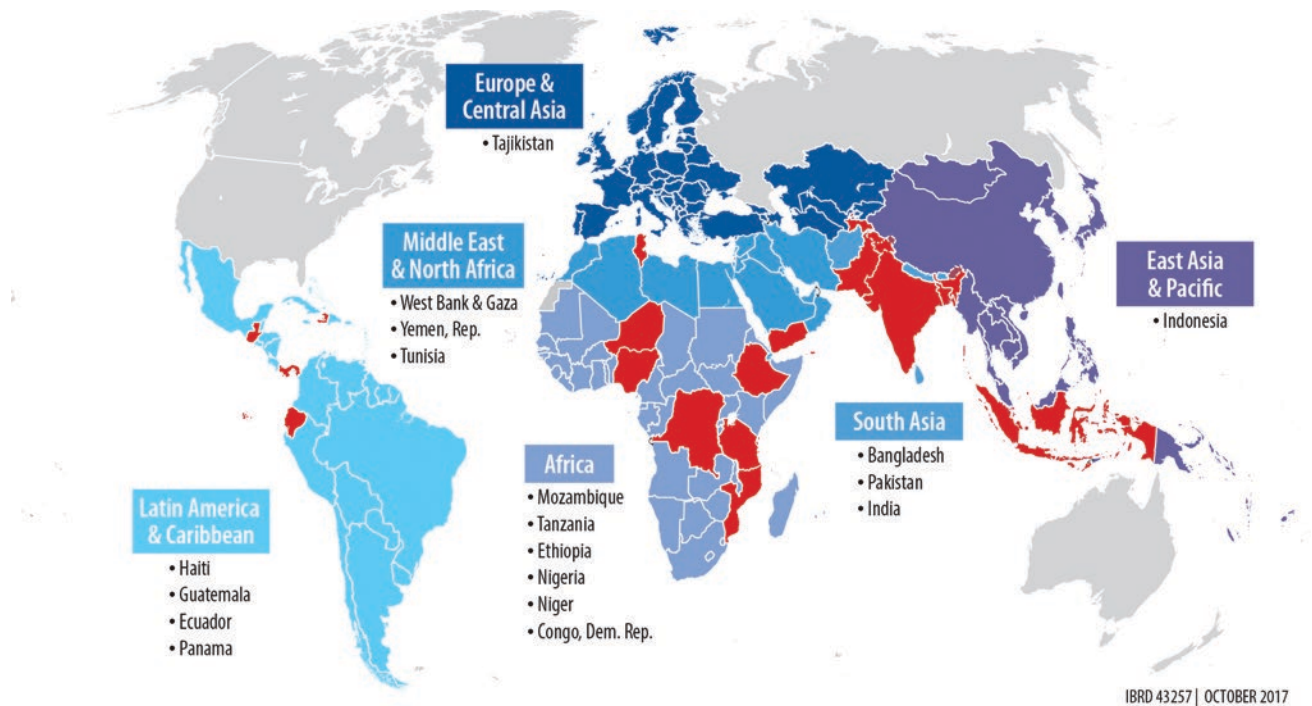
Source: WASH Poverty Diagnostic Initiative.

allocate resources to those in need. Mapping access to WASH across locations and social groups can provide information on the distribution of well-being, beyond what is provided by poverty indicators. Also, it should be noted that the correlation between monetary and nonmonetary (that is, geographical and social) indicators is not perfect because these indicators capture different concepts and can vary independently of one another.

WASH and Poverty

Understanding the relationship between WASH services and poverty can inform the more efficient use of resources. This in turn can help service providers reach those in need, reduce inequalities between population subgroups, and track differences in access. The Initiative is a first attempt to monitor progress toward the SDGs at a local scale. In addition, the initiative demonstrates how factors such as WASH indicators and income poverty can be overlaid and spatially represented. The result is a nuanced picture of the interplay between poverty and WASH that not only highlights geographic areas of need (that is, where poverty rates are high and access low) but also potential islands of effectiveness (that is, where access rates are high despite high income poverty). This is important, as it increases the precision with which resources can be targeted.

WASH and Child Health

The Initiative represents the most systematic effort to date, using country-level data, to quantify the relationship between WASH and child health outcomes. These results should inform policy, investments, and advocacy for cross-sectoral collaboration. The link between inadequate

WASH and poor health (such as diarrheal disease) are well established in the literature. There is also a growing body of evidence linking poor WASH to undernutrition, as evident, for example, in the rates of stunting among children under five. The Initiative takes these findings and applies them to specific country contexts, demonstrating where and for which groups the burden of disease is greatest due to inadequate WASH.

WASH Service Delivery

WASH reform initiatives are typically specific to the sector or a particular service—and planners look at rural water or urban sanitation, for instance, in isolation. To better handle the gaps between policy and implementation there is a need to engage with the constraints imposed by the broader institutional arrangements[12] within which WASH services are financed, managed, and delivered, and that affect the quality and sustainability of these services. This broader perspective opens up the ambit of reform efforts to recognize political and other nontechnical factors that impede or enhance service delivery. Doing so requires a deeper understanding of cross-cutting public management issues such as planning and budgeting, public investment management, financial management, accounting, fiscal reporting, procurement, and intergovernmental systems that impact all services and that are in some form or fashion tied to politics. In this vein, the WASH Poverty Diagnostic Initiative supports and promotes an emerging approach to improving service delivery that entails being problem driven, taking a more adaptive path to finding solutions, and working "with the grain" of politics in the local context (see Booth 2011; Kelsall 2011; and Levy 2014). Even where the characteristics of services such as sanitation are not politically salient today, things may change tomorrow. The story of the "Great Stink" in London shows that the incentives of politicians can shift drastically in a short time. The examples from the case studies presented in this report reflect a problem-driven approach. However, they stop short of providing universally valid solutions as, by its very nature, the approach is context and country specific.

Road Map

The remaining five chapters of this report are organized by common themes that emerged across the case studies. **Chapter 2** discusses the inequalities in WASH services observed with respect to income, location, social category, and time. **Chapter 3** looks at how WASH investments can best nurture human capital. Here, health outcomes are considered as an additional filter in decisions on how and where to prioritize WASH investments. Specifically, the chapter looks at the burden of childhood diarrheal disease and undernutrition, and at the interaction between WASH and a selection of health services. **Chapter 4** discusses the allocation of WASH resources, and begins to highlight the disconnect between stated policy objectives and implementation. The Initiative does not explore the political economy of how and why certain policies are promoted and why allocation decisions often do not reflect the stated policy in a country. As highlighted in the 2017 *World Development Report* (World Bank 2017), this is an important question, but was beyond the scope of this initiative. **Chapter 5** builds on the previous chapters and focuses on the issue of efficiency in resource use. This chapter explores why services are failing, and steps outside traditional modes of thinking to look at the broader governance context in which services are delivered. The aim is not to develop or hypothesize a set of solutions to the challenges identified, but rather to present a different approach to service delivery to inform future reform efforts. A brief conclusion, titled "**Looking Toward the Sustainable Development Goals**," will suggest potential ways for government officials and development partners to do business differently to meet the SDG goals.

Unless otherwise cited, all estimates and analysis in this synthesis report derive from the 18 country-level diagnostics published in 2016 and 2017. These are available at www .worldbank.org/washpdinitiative.

Notes

1. The SDGs, otherwise known as the Global Goals, are a universal call to action to end poverty, to protect the planet, and to ensure that all people enjoy peace and prosperity. These 17 goals build on the successes of the Millennium Development Goals (MDGs), while addressing additional topics such as climate change, economic inequality, innovation, sustainable consumption, peace, and justice, among other priorities. The goals are interconnected—the key to success in one may involve tackling issues more commonly associated with another (United Nations Development Programme, UNDP).
2. Azariadis and Stachurski (2005) describe the poverty trap as a self-reinforcing mechanism that causes poverty to persist.
3. The WASH Poverty Diagnostic Initiative is co-led by the World Bank's Water and Poverty global practices, and was implemented in close collaboration with the Governance and the Health, Nutrition, and Population global practices.
4. Bangladesh, the Democratic Republic of Congo, Ecuador, Ethiopia, Guatemala, Haiti, India, Indonesia, Mozambique, Niger, Nigeria, Pakistan, Panama, Tanzania, Tajikistan, Tunisia, and the Republic of Yemen.
5. This idea was introduced by Booth (2011) and Kelsall (2011). Levy (2014) categorizes countries according to their political settlements (also called "elite bargains") and institutional complexity and describes the kinds of reform efforts that would be consistent with these.
6. The JMP, co-led by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF), has been monitoring global progress toward the MDGs since 1990 and is responsible for reporting on SDG targets and indicators related to WASH.
7. "Safely managed water" is improved water that is located on premises, available when needed, and free of biological and chemical contamination.
8. Under SDG 6 there are six targets that comprehensively deal with not only water supply and sanitation but also water resource management. The WASH Poverty Diagnostic Initiative focused most on targets 6.1 and 6.2 and to some extent 6.3 (https://sustainabledevelopment.un.org/sdg6).
9. Note that target 6.3 was addressed in a more limited manner in the study countries, based on data availability.
10. The drop in access to be expected when shifting from a focus on "improved" to "safely managed" water is particularly high in Ecuador in Ethiopia, at 22 and 53 percentage points, respectively.
11. The WASH Poverty Diagnostic Initiative covers 17 countries and the West Bank and Gaza. For purposes of convenience, this report refers to the 18 entities collectively as countries or, less frequently, as economies.
12. Institutions are the "humanly devised constraints that shape human interaction" (more commonly referred to as the "rules of the game") and organizations are "groups of individuals bound by some common purpose to achieve objectives" (North 1990). Combined, the two constitute the "institutional arrangements," or governance environment, observed in a particular area. Intergovernmental arrangements, regulations, and such compose the "institutional architecture."

References

Azariadis, C., and J. Stachurski. 2005. "Poverty Traps." In *Handbook of Economic Growth*, vol. 1, Part A, edited by P. Aghion and S. Durlauf. Holland: Elsevier.

Booth, D. 2011. "Introduction: Working with the Grain? The Africa Power and Politics Programme." *IDS Bulletin* 42 (2): 1–10. doi:10.1111/j.1759-5436.2011.00206.

Kelsall, T. 2011. "Going with the Grain in African Development?" *Development Policy Review* 29 (s1): s223–51. doi:10.1111/j.1467-7679.2011.00527.

Levy, B. 2014. *Working with the Grain: Integrating Governance and Growth in Development Strategies*. New York: Oxford University Press.

North, D. C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge, United Kingdom: Cambridge University Press.

World Bank. 2017. *World Development Report 2017: Governance and the Law*. Washington, DC: World Bank.

Chapter 2
Inequality in Access to Water Supply, Sanitation, and Hygiene

There is widespread agreement that the poor are less likely to have and to use critical infrastructure, services, and supply chains (hereafter referred to as "access") than are the non-poor. In an ideal world, there would be no correlation between access and measures of poverty.[1] But the ultimate goal—universal access to high-quality services—is unquestionably difficult to achieve. Consider a fast-growing city in a developing nation: decision makers often face a trade-off between providing more people with some degree of access, and fewer people with higher-quality access. They may choose to install centralized public restrooms or public taps in a low-income housing development than provide each household with an individual connection. And where such services are indeed on household premises, their quality may be subpar. In the context of budget constraints, it is clear that there are no easy answers. Different contexts require different technical solutions. Where the chlorination of water systems is not feasible, for example, other interventions that protect public health, such as household water treatment, can be promoted.

So, who has access to what services, where, and of what quality? This analysis centers on the definitions of water supply, sanitation, and hygiene (WASH) levels used to track progress toward the Millennium Development Goals (MDGs), which formed the basis for efforts to improve WASH access between 1990 and 2015 and remain intrinsic to the new monitoring framework of the Sustainable Development Goals (SDGs) for 2030, on which data are scarce. This chapter builds on the MDG indicators and uses SDG definitions when possible (box 2.1). These WASH indicators have the potential to accelerate progress toward the achievement of SDG 1, "End Poverty in all its forms everywhere"; and SDG 10, "Reduce inequality within and among countries."

The evidence presented here shows significant disparities in the quality of drinking water, sanitation, and hygiene facilities and services between the poor and non-poor, between rural and urban areas, and across and within geographic regions of the same country. Traditionally disadvantaged groups—including women, the indigenous, and the disabled—suffer an additional burden. The size of this burden increases alongside membership in multiple groups; in some pockets of both rural and urban areas, it poses a dire threat to basic health.

This chapter summarizes the inequality patterns revealed across the 18 countries studied by the WASH Poverty Diagnostic Initiative, and organizes the discoveries by their correlation with several different domains, or "spaces": poverty, location, social identity, and time. Considering the interrelationship of poverty and safely managed WASH, it compares the bottom 40 percent (B40) of the wealth distribution with the top 60 percent (T60). It also presents findings for populations under the national poverty line as well as those categorized by international standards as living in extreme poverty. As for location, the chapter discusses asymmetries between people living in rural and urban areas, as well as differences between and within (i) cities and (ii) subnational divisions. The chapter then turns to critical disadvantaged social groups, with a focus on women, the indigenous, and the disabled. Finally, the chapter considers inequality across time by looking at intergenerational disparities.

Box 2.1: Water and Sanitation Definitions Used throughout this Report

The Water Supply, Sanitation, and Hygiene Poverty Diagnostic Initiative uses five key indicators of water quality and access:

- *Improved water* sources are those which, by the nature of their construction and when properly used, adequately protect the source from outside contamination, particularly fecal matter. Such sources include piped water to yards or plots, public taps or standpipes, tube wells or boreholes, protected springs, and rainwater.

- *Basic water* is improved water that can be collected in no more than 30 minutes, round-trip.

- *Improved water on premises* fulfills the same requirements as improved water, but further implies that it is available directly, on household premises.

- *Piped water on premises* fulfills the same requirements as improved water on premises, but specifies that water is provided through pipes.

- A *safely managed water* service implies that the household's drinking water source is improved and on premises, and that water is available when needed and is free of fecal and chemical contamination.

The following four key indicators are used when referring to sanitation and hygiene:

- *Open defecation* is the practice of people defecating outside and not into a designated toilet.

- An *improved sanitation* facility is one that hygienically separates users from contact with fecal matter; the facility may be unshared, or shared by two or more households.

- *Improved sanitation* implies access to an improved sanitation facility that is not shared with any other household.

- *Sewerage* implies that a household is connected to a sewer system.

Source: WASH Poverty Diagnostic Initiative.

The analysis aims to supports two goals: improving overall access to safely managed WASH, and ensuring its equitable allocation. Both are needed for an economy to achieve positive socioeconomic outcomes in the critical areas of early childhood development, education, health, and information. In this way, the analysis is geared to provide important WASH keys to unlock the World Bank's twin goals—to end extreme poverty and boost shared prosperity—and, simultaneously, speed progress toward SDG targets 6.1 and 6.2 (see chapter 1).

Acknowledging and understanding the evidence is critical to developing the priorities and policies needed to achieve the universal coverage that the SDGs are striving for. This chapter contributes critical documentation and quantification of known inequalities using the latest data assessed to be of sufficient validity and reliability. The analysis also uncovers several important patterns and insights that are less known. For example, in *Bangladesh* and the *Democratic Republic of Congo*, water quality issues affect both the T60 and B40 populations and are pervasive throughout regions and across different types of water technology.

Poverty Space: A Closer Look

Analysis across countries suggests that among the studied factors, wealth is the most important determinant of WASH status. Some countries have made laudable progress in expanding access to improved drinking water and sanitation (see box 2.1 for definitions) among B40 households.[2] However, the gap between these and T60 households persists. Meanwhile, in other countries, B40 households are gaining access in urban but not rural areas. In short, the gap in access to improved WASH between the B40 and T60 remains large the world over, though access patterns vary widely in and between countries (figure 2.1). On average, 78 percent of households in the T60 have access to *improved water*, compared with only 63 percent of households in the B40; 33 percent of households in the T60 have access to *piped water on premises*, compared with only 17 percent of the B40. Interestingly, the average gap between the T60 and B40 does not change when moving from improved water to piped water on premises. One might expect it to widen, but in many countries, where the T60 also lack access to piped water on premises, the gap decreases.

Among the study countries, access to sanitation was far lower among the B40 than the T60 (figure 2.2). Thirty-seven percent of people in the B40 practice *open defecation*, compared with 17 percent of households in the T60. Meanwhile, the number of people practicing open defecation is distributed across these groups. Two in three (64 percent) of people in the T60 have access to shared or unshared improved sanitation facilities, compared with close to one in three (40 percent) among the B40. Finally, only half of the population in the T60 has access to improved sanitation whereas 29 percent of the population in the B40 do. Similar to piped water on premises, when higher standards of sanitation are considered (for example, shared vs. unshared bathrooms), service coverage drops for both the T60 and B40, and on average the gap between them narrows slightly. The B40 continue to be worse off, but the gap does not grow.

Figure 2.1: Access to Improved Water, by Wealth Level, Selected Countries
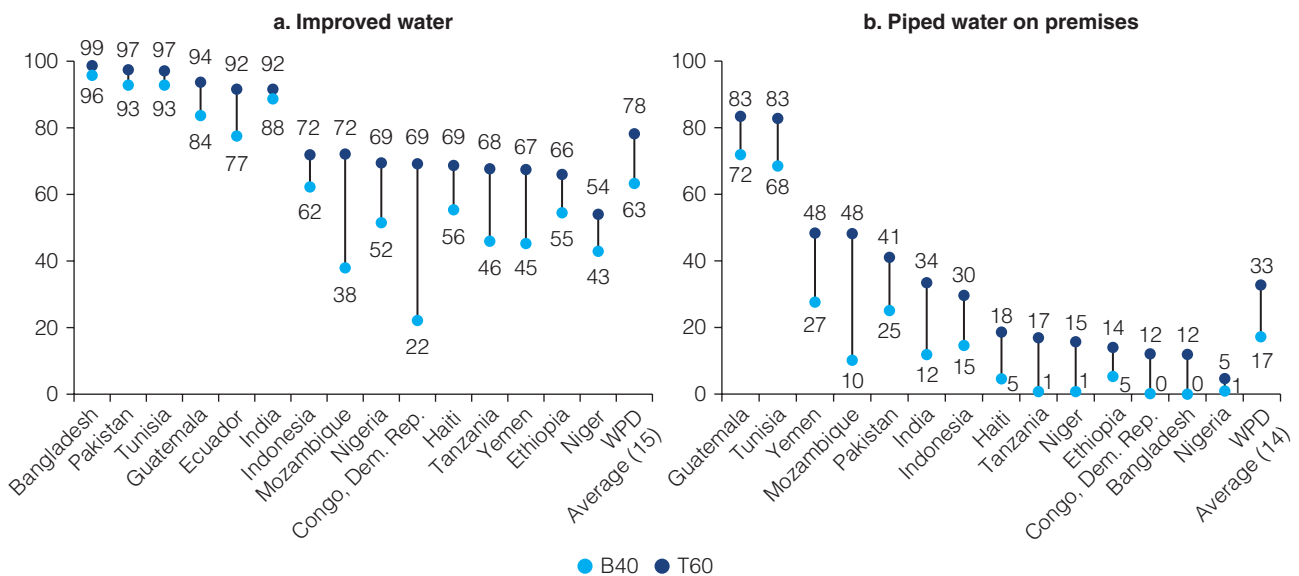
Source: Andres, Loughnan, and Li 2017.
Note: Because of data constraints, the number of countries in the average for the WASH Poverty Diagnostic varies by parameter. B40 = bottom 40 percent of asset wealth distribution; T60 = top 60 percent of asset wealth distribution; WPD = WASH Poverty Diagnostic.

Figure 2.2: Sanitation Indicators, by Wealth Level, Selected Countries
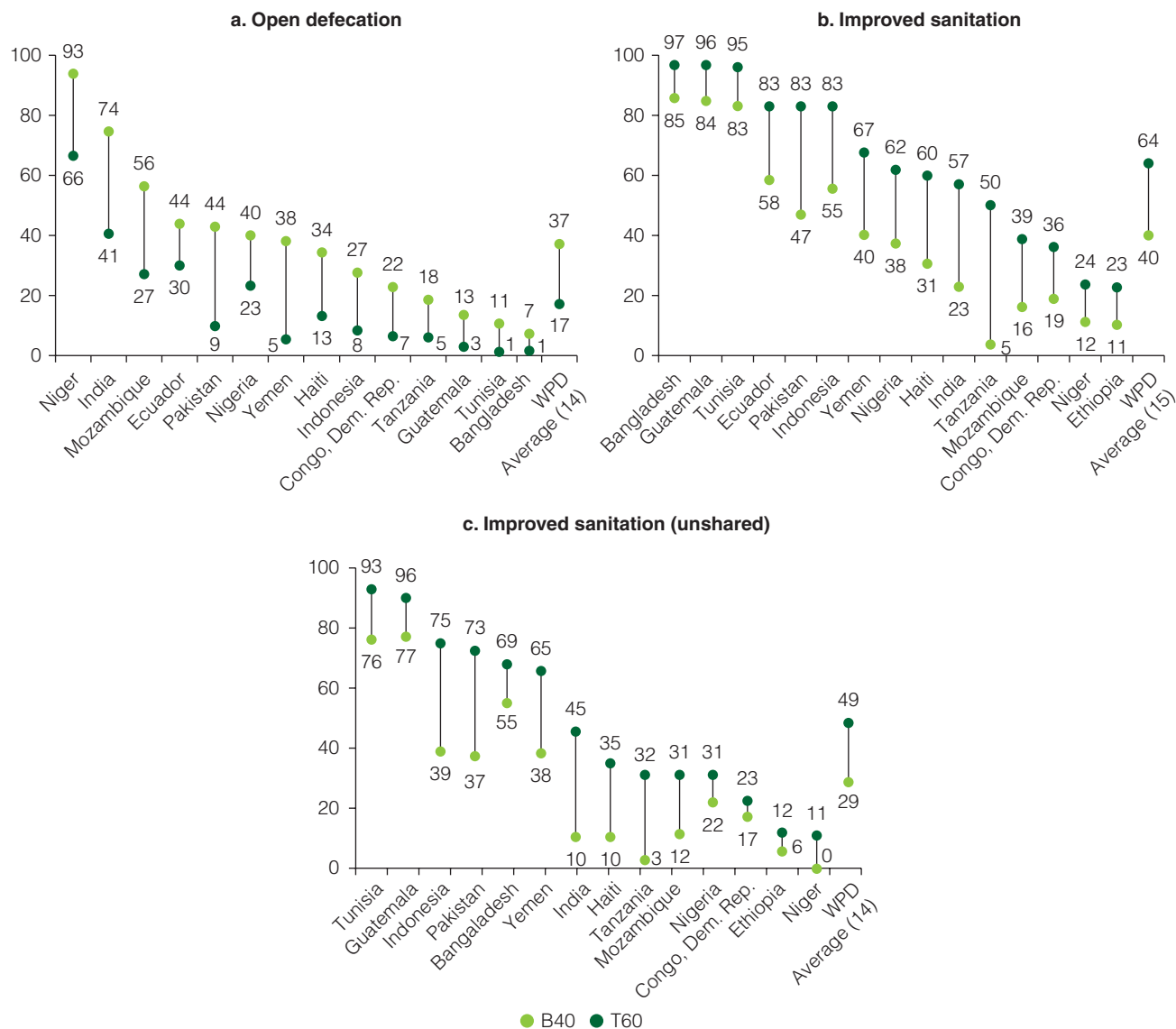
a. Open defecation

b. Improved sanitation

c. Improved sanitation (unshared)

● B40 ● T60

Source: Andres, Loughnan, and Li 2017.
Note: Because of data constraints, the number of countries in the average for the WASH Poverty Diagnostic varies by parameter. B40 = bottom 40 percent of asset wealth distribution; T60 = top 60 percent of asset wealth distribution; WPD = WASH Poverty Diagnostic.

Physical Space: How Location Determines WASH Access

Access to improved water services is dramatically higher in urban than in rural areas. While almost all the population living in urban areas has access to improved water services, only two-thirds of households living in rural areas enjoy such access.[3] Countries like *Tunisia*, *Bangladesh*, *Panama*, and *India* are close to reaching universal coverage under the MDG indicators, but emerging evidence on the SDG indicators is cause for concern. Furthermore, the rural and urban divide remains stark in African countries, where less than half of the rural population has access to improved water sources. For instance, in *the Democratic Republic of Congo*, rural access rates to improved water are 33 percent, on average, compared with 84 percent in urban areas. **The urban-rural gap in access to drinking water piped to premises is**

even wider: half of the urban population, but only one-fourth of the rural (figure 2.3). Interestingly, gaps between urban and rural areas increase quite substantially when moving to the higher standard of improved water on premises, suggesting a decreased time burden for urban residents with some form of improved source. However, this gap decreases when moving to piped water on premises, which is fairly uncommon in urban areas across South Asia and Sub-Saharan Africa.

Low levels of overall access to sanitation facilities narrow the urban-rural gap. On average, about half of the population in the 18 countries covered by the WASH Poverty Diagnostic Initiative have access to an unshared, improved facility. Despite the progress made over the past 25 years—the Joint Monitoring Programme (JMP) for Water Supply and Sanitation[4] estimates that improved sanitation access worldwide rose from 54 to 68 percent between 1990 and

Figure 2.3: Access to Improved Water in Urban and Rural Areas, Selected Countries
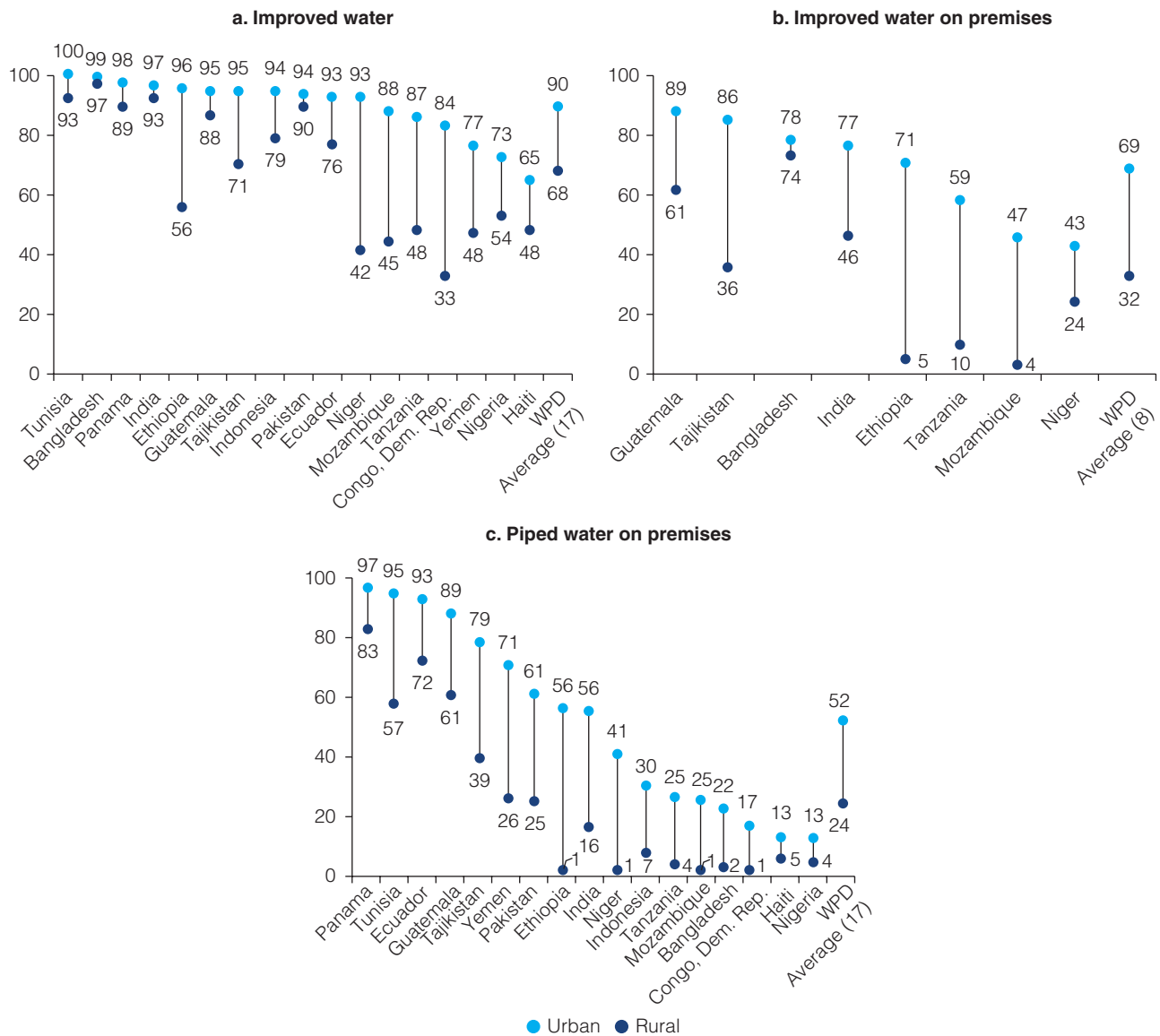
Source: Andres, Loughnan, and Li 2017.
Note: Because of data constraints, the number of countries in the average for the WASH Poverty Diagnostic varies by parameter. WPD = WASH Poverty Diagnostic.

Figure 2.4: Sanitation Indicators in Urban and Rural Areas, Selected Countries
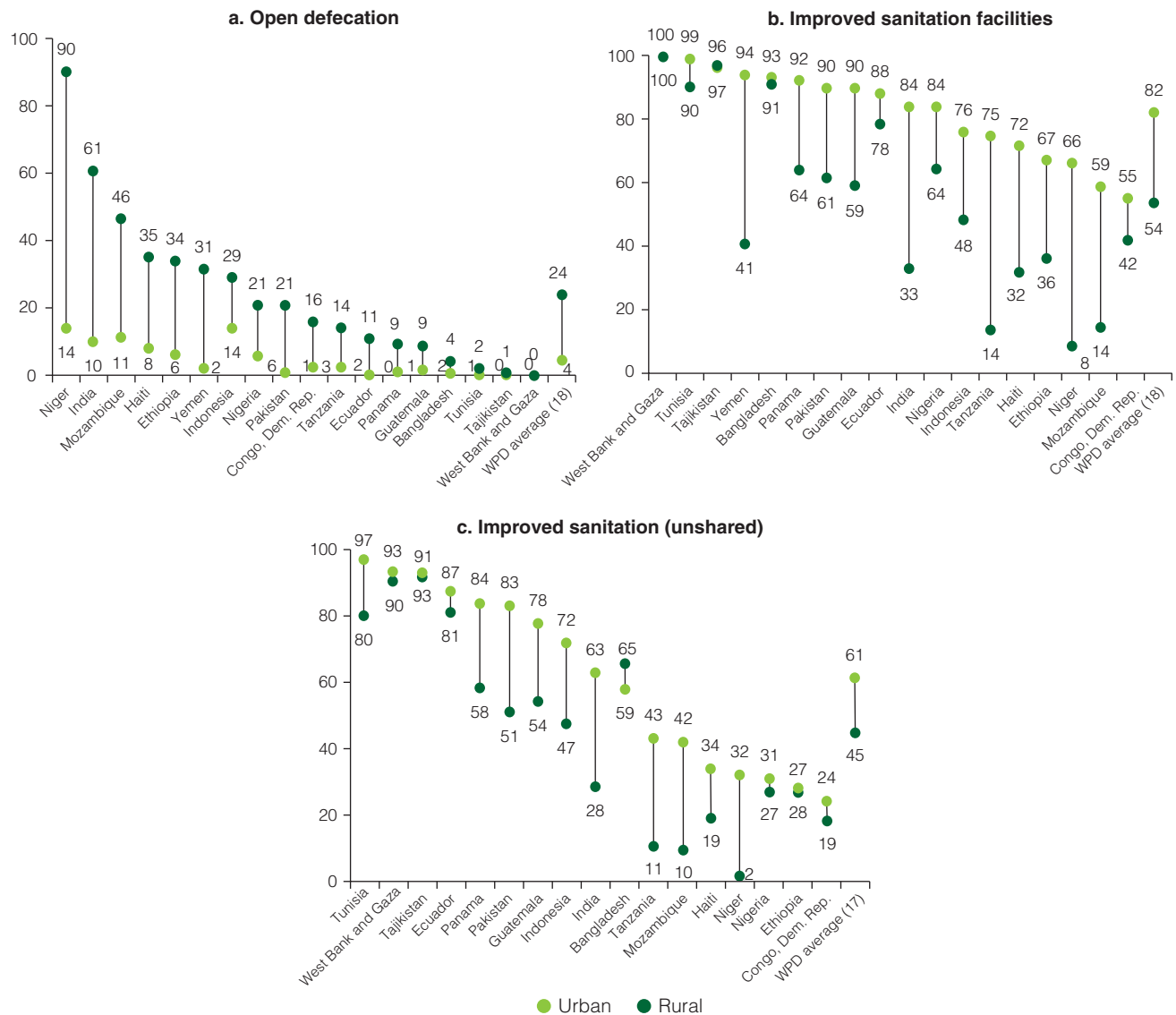
a. Open defecation

b. Improved sanitation facilities

c. Improved sanitation (unshared)

● Urban ● Rural

Source: Andres, Loughnan, and Li 2017.
Note: Because of data constraints, the number of countries in the average for the WASH Poverty Diagnostic varies by parameter. WPD = WASH Poverty Diagnostic.

2015—most of the 18 countries studied[5] did not meet the MDG for sanitation.[6] Open defecation is still overwhelmingly common in some of the countries, for example 71 percent of the population in Niger, 40 percent in *India*, and 15 percent in *Nigeria*. Most but not all occurs in rural areas: the rural share is estimated to be 90 percent. In terms of access to improved sanitation, 61 and 45 percent of the urban and rural population, respectively, are covered.

Levels of urban WASH access vary not only by city but within the same urban area; access in secondary cities remains worrisome and in some poor urban pockets, access rates are lower than in some rural areas. Looking at four of *Indonesia*'s largest cities—Jakarta, Medan, Surabaya, and Makassar—it is clear that the peripheries have both higher levels of poverty and lower levels of access than the city centers. In the *Democratic Republic of Congo*, concentrated investments in Kinshasa's water supply appear to have consolidated and raised access to improved water to near-universal levels over the past 15 years (figure 2.5), with the rest of the country lagging.

Figure 2.5: Access to Piped Water and Other Improved Drinking Water in the Democratic Republic of Congo
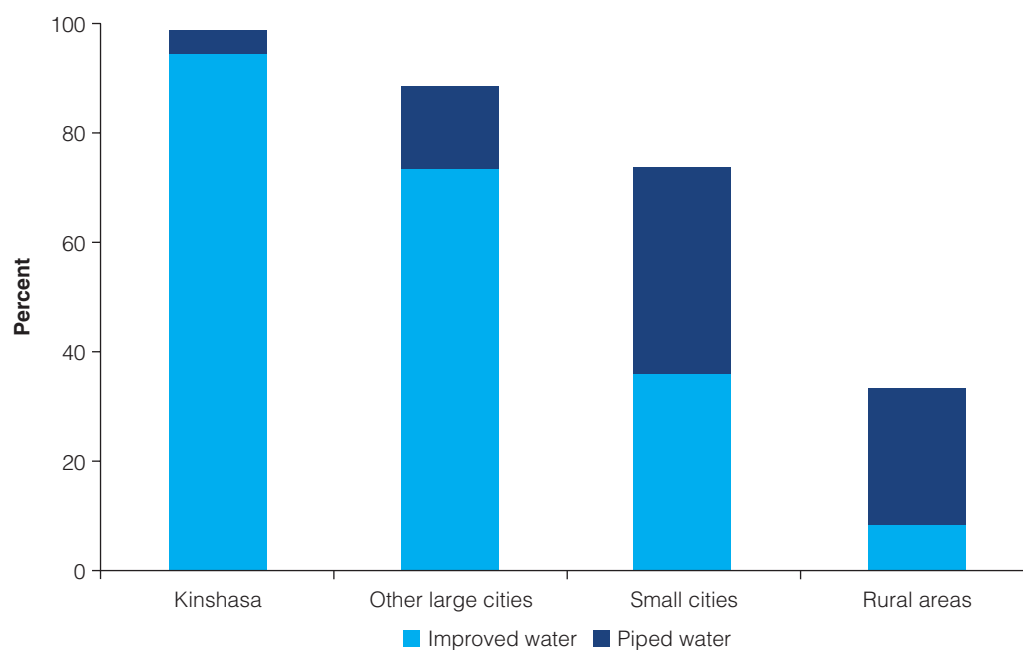
Source: World Bank 2017a.

Box 2.2: Urban Water and Sanitation in Ethiopia

In contrast to the experience of rural areas, urban water and sanitation services have delivered real benefits—but not equitably or sustainably. With over 10 million people gaining access to water from a piped source on premises, significant time savings have been realized in urban areas. However, these savings have been disproportionally captured by relatively well-off households (that is, those in the top 60 percent of the wealth distribution), who are nearly four times more likely to have access to piped water on premises than poorer households (those in the bottom 40 percent of the wealth index). The reasons for this inequitable uptake are twofold. For about a third of households that are not connected, mainly in smaller towns, there is a lack of infrastructure to connect to. For the remainder, mainly in large urban centers, the infrastructure exists but households can't pay or utilities simply aren't making the connection.

Source: World Bank forthcoming(a).

Access to WASH in urban slums poses a major challenge. In **Bangladesh**, only 13 percent of households in the slums of the five largest metropolises have their own sanitation facilities. Inadequate WASH in newly urbanized/periurban areas reflect a lack of capacity—at both the local and national level—to plan for rapid development and expand service networks as needed.

Countries also suffer important WASH disparities across provinces: for the first time the Initiative systematically exploited data to estimate disparities in access down to the district level.

Map 2.1: Heat Maps of Access to Water in Nigeria

a. Improved water

Percent
- 80–100
- 60–80
- 40–60
- 20–40
- 0–20

Admin boundaries
— States

0 25 50   100 Miles

b. Basic water

Percent
- 80–100
- 60–80
- 40–60
- 20–40
- 0–20

Admin boundaries
— States

0 25 50   100 Miles

c. Improved water on premises

Percent
- 80–100
- 60–80
- 40–60
- 20–40
- 0–20

Admin boundaries
— States

0 25 50   100 Miles

d. Piped water on premises

Percent
- 80–100
- 60–80
- 40–60
- 20–40
- 0–20

Admin boundaries
— States

0 25 50   100 Miles

Source: World Bank 2017b.

For instance, analysis in ***Nigeria*** shows with presicion which pockets drop out as higher standards are applied from easier-to-achieve (for example, improved water) through to higher (for example, piped on premises) standards. Such findings are observed in maps A to D in map 2.1,[7] as the standards of quality and technology required progressively increase. Overall, it can be observed that clusters in the northcentral, southwest, and southcentral regions exhibit the best performance overall. Piped water on premises is scarcely available throughout the country, short of a few small pockets in the Taraba, Jigawa, and Yobe states.[8]

Social Space: Differences in and among Groups

While significant progress has been made worldwide toward the WASH-specific targets of the MDGs, few improvements, if any, have reached the most vulnerable groups in society.[9] The SDGs seek to address this disparity, by calling for countries to "achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations" (target 6.2). The SDGs also

Figure 2.6: Who Fetches the Water? Data from Niger

		Women	Girls	Men	Boys
All	2012	60	10	20	8
All	2006	60	18	9	13
Rural	2012	62	10	19	8
Rural	2006	62	17	9	12
Other Urban	2012	34	12	35	19
Other Urban	2006	35	20	12	32
Niamey	2012	52	10	23	15
Niamey	2006	43	44	1	11

Share of who fetches water (%)

■ Women ■ Girls ■ Men ■ Boys
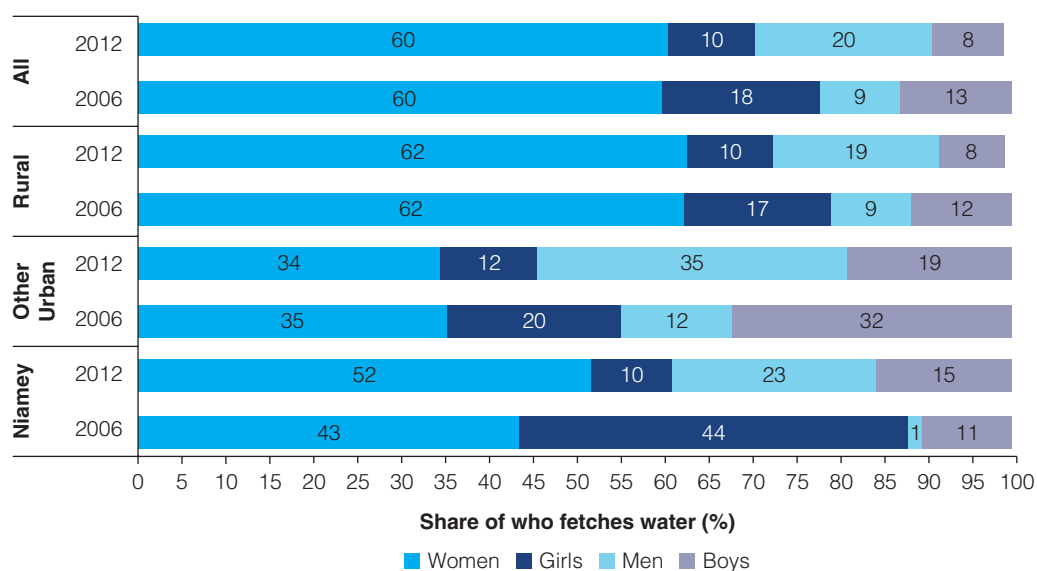
Source: World Bank forthcoming(b).

stipulate that coverage rates for poor and vulnerable groups should increase at a faster rate than for other unserved populations (WHO/UNICEF 2013).

The gender of the household head may play a small role in explaining differences in access to water and sanitation, but women and girls continue to bear the burden of most household water-related tasks. Such tasks are often very time consuming. Where paths to water sources are long and through remote areas, this may put women at risk of sexual and other physical violence, which is prevalent in fragile countries. For example, in *Niger,* the average route increased between 2006 and 2012, reaching almost an hour round-trip (figure 2.6). The average female, whether woman or girl, spends about 36 10-hour working days a year collecting water. In rural areas, the time spent fetching water is especially high. Adding a 30-minute round-trip threshold to the definition of improved access to drinking water (termed "basic" in the SDG monitoring framework) drops access rates to improved water in rural settings by 9 percentage points. In *Panama,* the Initiative indicates that girls in the sixth grade are 6 to 10 percentage points more likely to have missed at least one day of school during the past six months than their male peers. This and related findings indicate that learning outcomes appear to be positively correlated with WASH facilities.

The ethnicity[10] of the household head is found to play a role in explaining a household's access to water and sanitation in *Nigeria*, *Panama*, *Guatemala*, and *Ecuador*. While it is difficult to disentangle the causal relationships between lack of access and factors such as income poverty, location, and ethnicity, regression analysis shows that—beyond income poverty—ethnicity is a determinant in these countries. Acknowledging the vulnerabilities of particular social groups is the first step toward addressing them. Similarly, in *India*, vulnerability is seen to differ by caste. A child born into one of the lowest castes is three times more likely to live in a household where members defecate in the open than is a child born into the higher castes. Even after controlling for location and income, a low caste is still seen to contribute to the practice of open defecation.

Even where households report that their members usually use an improved WASH source, certain household members may not be able to access it without assistance. In particular, **people with disabilities** face significant barriers. In *Tajikistan*, 24 percent of households reported having at least one household member with one or more functional disabilities of various levels

of severity who was unable to access the main drinking water source without assistance. In *Nigeria*, around 67 percent of respondents believe that people with disabilities face challenges in accessing and using toilets, and around 51 percent believe that the needs of disabled people are not considered during the design of public or private toilets (UNICEF 2017).

Time Space: The Human Opportunity Index

Latin America has taken the lead in moving toward providing all children with access to water services. Of the countries included in this study, *Panama* ranks the highest on the Human Opportunity Index (HOI; see box 2.3 for details) for improved and basic water. Although all five African countries in the study have HOIs below 60, *Niger* leads the region in improved water services: 58 percent are equitably distributed. *Mozambique* and the *Democratic Republic of Congo* rank at the bottom of the list. All countries face challenges in ensuring equitable (and, in many cases, any) access to piped water. Moreover, opportunities to access sanitation services rank even lower than access to water services.

Inequality in access to water services is mostly the result of variations in wealth and location. Among the five factors[11] considered in our analysis, that a household is part of the B40 and is located in a rural area are the strongest predictors[12] of a child's lack of access to water services (figure 2.7).

Box 2.3: The Human Opportunity Index

The Human Opportunity Index (HOI) is the main instrument used by the Water Supply, Sanitation, and Hygiene (WASH) Poverty Diagnostic Initiative to measure inequalities in access to WASH across time. It can be interpreted as a composite of two indicators: (i) the level of coverage of those basic services necessary for human development, such as WASH, among the population of interest; and (ii) the degree to which that level is conditional on circumstances into which children are born (such as gender, income, or household characteristics). Much inequality is an outcome of the chances of birth, and circumstances over which individuals have little or no control, but that often trap them in poverty and reduce access to basic services. The HOI essentially measures how personal circumstances affect a child's probability of accessing the services that are necessary to thrive and succeed in life. If societies aim for equitable development, they need to ensure that as many children as possible have access to basic opportunities.

To measure inequality, the HOI takes the coverage of each basic service, and then discounts that coverage by how unequally the service is distributed among a given population. If two regions within a country have identical rates of access to water, they may still have a different HOI ranks if the residents who lack access share a personal circumstance beyond their control, such as being female, living in a rural area, or living in a household whose head has a primary-school education or less. The HOI runs from zero to 100; thus, a place that has achieved universal coverage of a given service would score 100, while a place with more inequality in coverage would have a lower score.

Source: Andres and Cubas 2017.

Figure 2.7: Contribution of Circumstances to Unequal Access to Improved Water and Sanitation

a. Improved water on premise

Country	B40	Rural	HH single	HH female	HH education
BGD	74.7	7.9			16.7
DRC	27.7	58.3			12.4
IND	58.6	22.0			15.8
MOZ	29.2	49.9			18.4
NER	24.4	62.9			11.9
NGA	57.1	22.7			15.7
PAN	40.1	31.1			27.5
TJK	52.6	44.3			
TZA	35.0	50.4			13.1
PSE	67.6	29.0			

Legend: ■ B40 ■ Rural ■ HH single ■ HH female ■ HH education

b. Improved sanitation (unshared)

Country	B40	Rural	HH single	HH female	HH education
BGD	69.9				25.6
DRC	41.8	22.9		21.9	9.8
IND	54.9	25.5			18.3
MOZ	44.6	33.9			20.6
NER	40.3	41.4			15.4
NGA	63.8	17.1			17.9
TJK	6.1	29.4	9.3	33.3	22.0
TZA	49.6	32.1			16.3
PSE	82.7	3.8			7.4

Legend: ■ B40 ■ Rural ■ HH single ■ HH female ■ HH education

Source: Andres and Cubas 2017.
Note: The five factors considered here are if: (i) the household is in the bottom 40 percent of the income distribution (B40), (ii) the household is in a rural location (rural), (iii) the household head is unmarried (HH single), (iv) the household head is a female (HH female), and (v) the household head has a primary level of education or less (HH education). BGD = Bangladesh; DRC = Democratic Republic of Congo; IND = India; MOZ = Mozambique; NER = Niger; NGA = Nigeria; TJK = Tajikistan; TZA = Tanzania; PSE = West Bank and Gaza.

New Insights into the Quality of Services

The previous section quantified several intuitive patterns of WASH access. This section highlights several unique findings regarding service quality that further elucidate the complexities and the challenges in the sector.

Although there have been significant increases in access to improved drinking water, most relate to water outside household premises, missing that critical element of classification under the SDG "safely managed" indicator. Most people in *Nigeria* (61 percent) have access to improved water, but only half of this is on premises. Approximately 14 percent of the population has access to basic water—that is, within a 30-minute round-trip—and 16 percent has access to improved water sources farther away. The same pattern is found in the *Democratic Republic of Congo,* where 50 percent of the population has access to basic water, but 25 percent of them must travel more than 30 minutes round-trip to get it. In *Ethiopia* between 2000 and 2011, the proportion of people able to fetch water within 30 minutes actually fell—from 65 to 56 percent—with the data suggesting that people may being walking farther to substitute improved water sources for unimproved ones closer to home. While a growing preference for improved sources would be encouraging, the time involved means that often less water is collected than adequate to cover basic hygiene needs.

Furthermore, the amount of time needed to access a reliable water source in rural areas varies greatly. Map 2.2 presents the amount of time needed to complete a round-trip journey to the closest functioning[13] water source from a given location in *Nigeria*, defined here as *the rural accessibility index* (see Andres, Inha, and Getthing 2017). Only 39 percent of the rural

Map 2.2: Round-Trip Journey to the Closest Functioning Improved Water Source, Nigeria, 2015

	Functioning
<30 mins	38.7%
30–60 mins	11.6%
1–2 hours	15.3%
2–4 hours	15.0%
4–6 hours	7.8%
More than 6 hrs	11.5%

Round-trip journey to water service points (functioning only)

- 0–30 mins
- 30–60 mins
- 1–2 hrs
- 2–4 hrs
- >4hrs

0 25 50   100 Miles
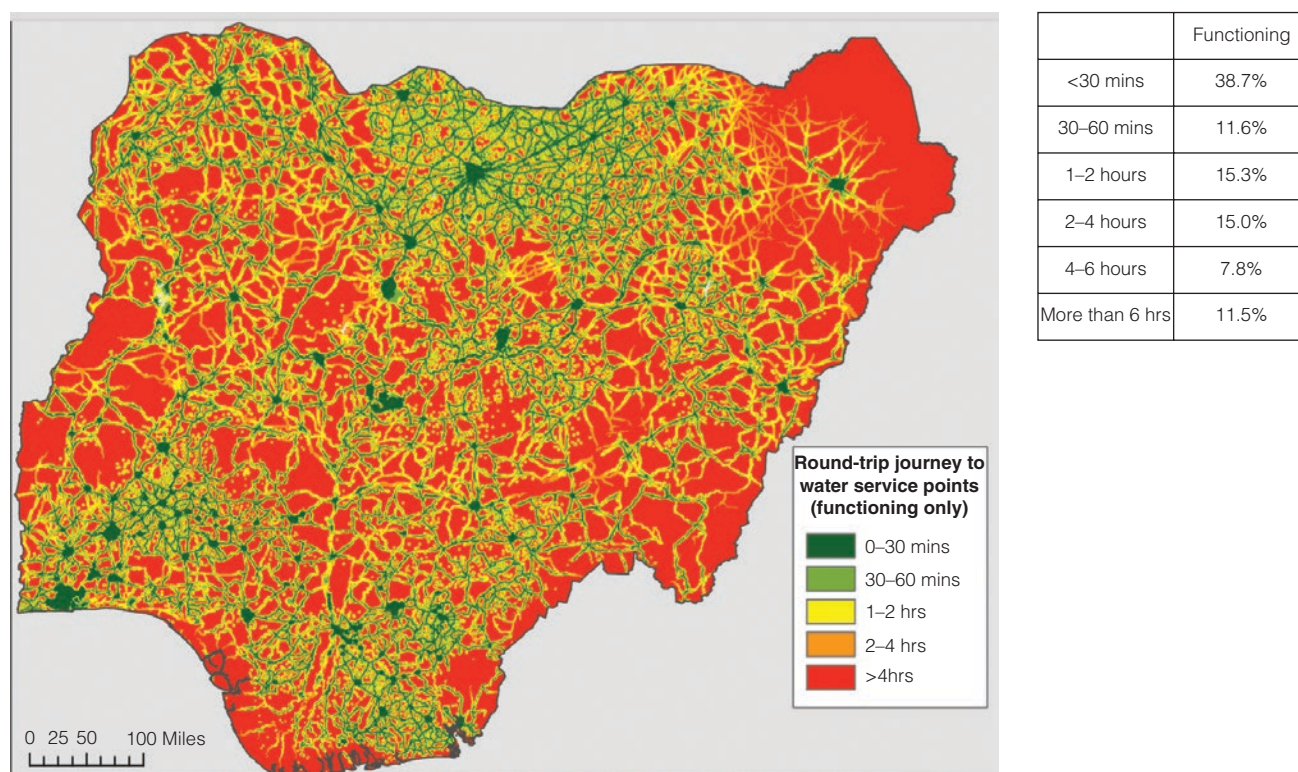
Source: World Bank 2017b.
Note: The "round-trip journey" expresses the time required to reach and return from a functioning, improved water point or water scheme.

population lives within a 30-minute round-trip of a functioning water source, and 34 percent of the population lives at least two hours away from such a source. Most alarmingly, over 26 million Nigerians living in rural areas must travel four or more hours round-trip to access a functioning water point.

While access to improved water at the national level increased in most of the countries analyzed, access to piped water on premises declined in one-third of them. In *Nigeria*, it deteriorated by 10 percentage points: from 12 percent in 1990 to 2 percent in 2015 (JMP 2015). This is mainly due to a steep decline of 29 percentage points within urban areas—from 32 to 3 percent during this period—due to rapid urbanization, lack of investment, and institutional constraints in the maintenance of services. Moreover, households continually face the risk of bacteriological and/or chemical contamination by increasingly relying on unregulated alternative water providers or private household solutions, such as manually drilled boreholes, the consequences of which are unknown due to limited data which offer limited data on aquifer recharge and saline intrusion. Similarly, in the *Democratic Republic of Congo*, water connections on premises have become relatively rare—as evident in a drop from 48 percent of the urban population in 1990 to only 17 percent in 2015. Urban populations in *Haiti*, *Tanzania*, and the *West Bank and Gaza* also suffered a decline in access to piped water on premises.

Successes in achieving the water MDGs hide some realities on the ground: the *E. coli* contamination at point of use is shockingly common and cuts across differences in location, supply technology, and wealth. For instance, though *Bangladesh* has made significant progress in switching to improved water infrastructure,[14] much of what is extracted remains contaminated with dangerous microbes, heavy metals, or salt. Whilst 97 percent of the population now relies on improved water infrastructure. However, half of the water sources (48 percent) are contaminated by *E. coli* and/or arsenic, which would disqualify them from the SDG definition of "safely managed" drinking water. Interestingly, problematic water quality seems be an issue for the rich and poor alike and is pervasive throughout regions and across different types of water technologies. For instance, piped water, often an exclusive asset of rich urban populations, seldom has high arsenic or salt content, but available data suggest it can still be highly contaminated with fecal bacteria. Piped water offers benefits of convenience and centralized regulation and treatment. However, it is a telling statistic that people who use piped water on their premises, which is theoretically the best, safest option, face *E. coli* contamination more than 80 percent of the time, a rate not much different than that of water drawn from ponds and streams. These levels of contamination in piped water supply are likely the result of inadequate treatment at production and/or frequent interruptions in supply (distribution networks act as vacuums when not fully pressurized, taking in contamination through leaky pipes and joints).

In the *Democratic Republic of Congo*, even among households with access to piped water in the relatively well-served capital, Kinshasa, more than a third of water samples were contaminated. In the city of Kindu, small hamlets in rural Equateur, and a cross-section of rural areas in South and North Kivu, *E. coli* contamination was even higher than Kinshasa. While piped water sources tend to perform better, the problem of highly prevalent fecal contamination clearly cuts across location and technology. In *Ecuador*, 33 percent of the water consumed in rural areas and 15 percent in urban areas is contaminated with the *E. coli* bacteria. Alarmingly, in *Ethiopia*, *E. coli* contamination of both protected and unprotected springs and wells was over 90 percent. Even where infrastructure costs more, as in the case of piped water systems, contamination rates were extremely high (more than 85 and 75 percent, respectively).

The vast majority of the population in the countries covered by this analysis uses pit latrines; because of data constraints the health risk is not yet well understood. Less than 5 percent of the population, a figure that has been nearly stagnant in the past 10 years, is connected to a sewer system. But even having a sewage connection does not mean that sewage is being properly transported and treated at a wastewater plant. A World Bank study (2014) estimates that less than 29 percent of all fecal sludge[15] is safely managed and treated in some cities. Evidence of fecal sludge treatment in rural areas is even scarcer. Under the SDGs, the entire

fecal sludge cycle—through to the neutralization of pathogens—will be monitored; available data suggest that the rates that the baseline used to measure progress toward "safely managed" sanitation will be set very low.

An overall absence of good hygiene practices exacerbates the perils of poor water and sanitation access. It all adds up to an environment in which harmful pathogens and parasites can be pervasive and detrimental to public health. Certain behavioral practices can determine the risk of being affected by poor sanitary environments. At homes in *Bangladesh*, only 28 percent of the population is observed to have a handwashing station with both water and soap, critical to meeting the hygiene component of the SDGs, which is also understood to mean that three-quarters of women face critical challenges to menstrual hygiene management. Most households with young children do not properly dispose of infant feces. Despite the high contamination of water sources, only 10 percent of the population report using an appropriate water treatment method.

New Insights from Spatial Analysis

As expected, there is a high correlation between access to improved water and improved sanitation; however, their relation varies and is difficult to generalize. Map 2.3 and figure 2.8 show the interaction between improved water and improved sanitation, broken down by quintiles and terciles, respectively. Almost a quarter of individuals live in areas with high access to both water and sanitation (red). However, 18 percent of citizens live in areas that have high access to improved water, but low access to improved sanitation (yellow), and 5 percent live in areas with high access to improved sanitation, but low access to improved water (blue).

Map 2.3: Access to Improved Water and Improved Sanitation, Nigeria, 2015
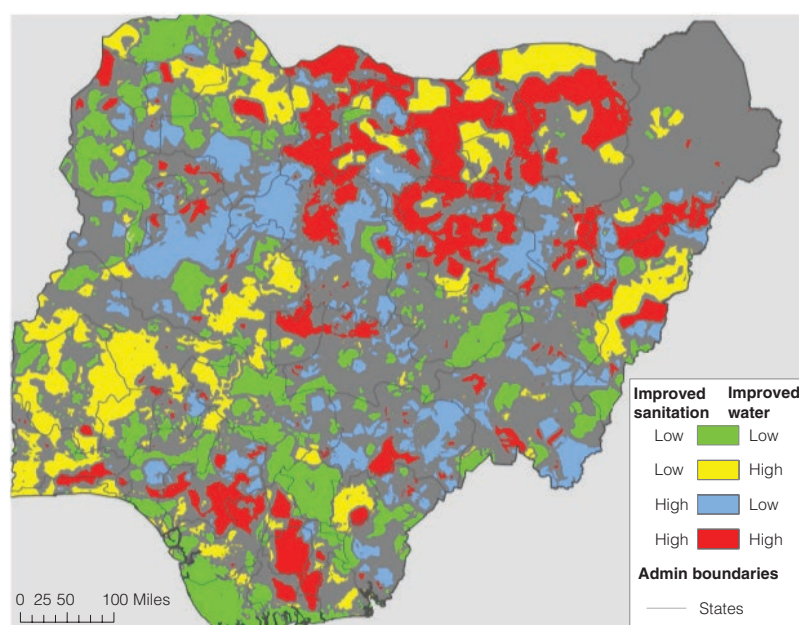
Source: World Bank 2017b.
Note: For improved water, low access = <24.6%; high access = >50.2%. For sanitation, low access = <13.7%; high access = >24.5%.

Figure 2.8: Interaction between Improved Water and Improved Sanitation, by Tercile, Nigeria, 2015
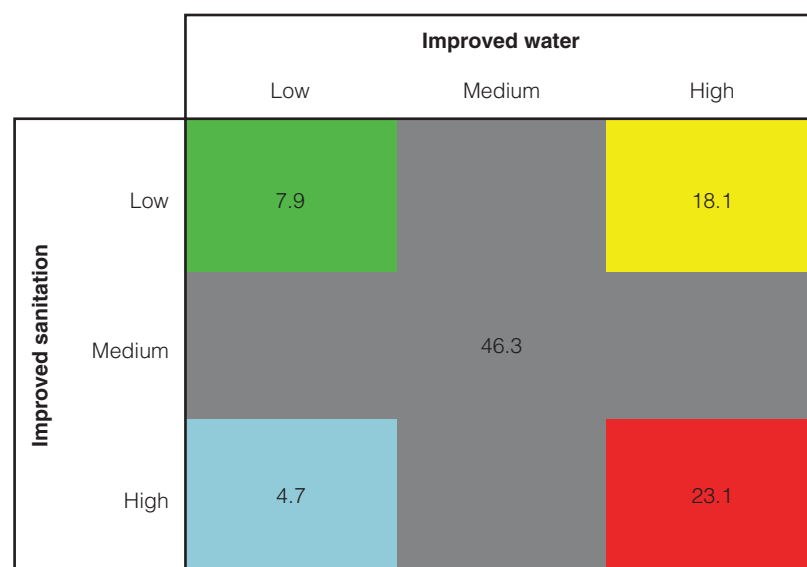
Source: World Bank calculations using NWSS 2015 data.
Note: This figure, based on data in map 2.3, shows the interaction between improved water and improved sanitation, broken down by terciles. For example: "low-low" represents the percentage of the population who are both in the bottom tercile of access to improved water and in the bottom tercile of access to improved sanitation.

In a notable achievement, the data collected for the WASH Poverty Diagnostic Initiative allow the identification of disparities in access at the district level. For instance, in *Ecuador*, the poorest parishes in Esmeraldas and Manabí are also the ones with the poorest access to water supply. In provinces such as Guayas, the picture is more mixed. Some parishes have relatively less poverty but also less access, whereas some poorer parishes have relatively more access; the same holds true for sanitation. In *Bangladesh*, many urban districts lack infrastructure. Those in the southeast fare the worst. In the hard-to-reach Chittagong Hill Tracts of the southeast, the mountainous and sparsely populated district of Bandarban ranks as the country's least served: only 44 percent of its people have access to an improved drinking water source. Geospatial mapping in *Tanzania* was also able to identify a high concentration of open defecation in the northeastern corner of the country, around Arusha and Manyara. This is an interesting discovery, as these are not the poorest areas. Understanding the reasons behind this finding requires further research.

Interestingly, in *Nigeria,* 11 percent of households can be characterized as poor but with adequate access to water.[16] Conversely, 6 percent of citizens can be characterized as rich, but lacking water (map 2.4 and figure 2.9). Most surprising, when considering access to piped water on premises, 37 percent of citizens live in areas that are both low in poverty and low in access to piped water. Such low-poverty, low-access areas are found in the western regions, particularly in the northwest and southwest, and to some extent in the south-central region. Similarly, the relationship between poverty levels and access to improved sanitation is not straightforward. About 22 percent of Nigerians are in low-poverty areas and have low access to improved sanitation, and about 10 percent of Nigerians are in high-poverty areas and have high access to improved sanitation.[17] This subnational analysis, the first of its kind, provides policy and decision makers a tool they can use to visualize differences across locations with a high degree of precision.

Map 2.4: Poverty and Access to Improved Water, Nigeria, 2015

Poverty	Improved water
Low	Low
Low	High
High	Low
High	High
Admin boundaries	
—	States

0 25 50   100 Miles

Source: World Bank 2017b.
Note: Low poverty = less than 31.5% of population is below 2012 poverty level; high poverty means that more than 47.1% of population is below 2012 poverty level). Areas are considered as having a low level of access to improved water if coverage is lower than 24.6% and a high level if coverage is higher than 50.2%.

Figure 2.9: Interaction between Poverty and Access to Improved Water, by Tercile, Nigeria, 2015
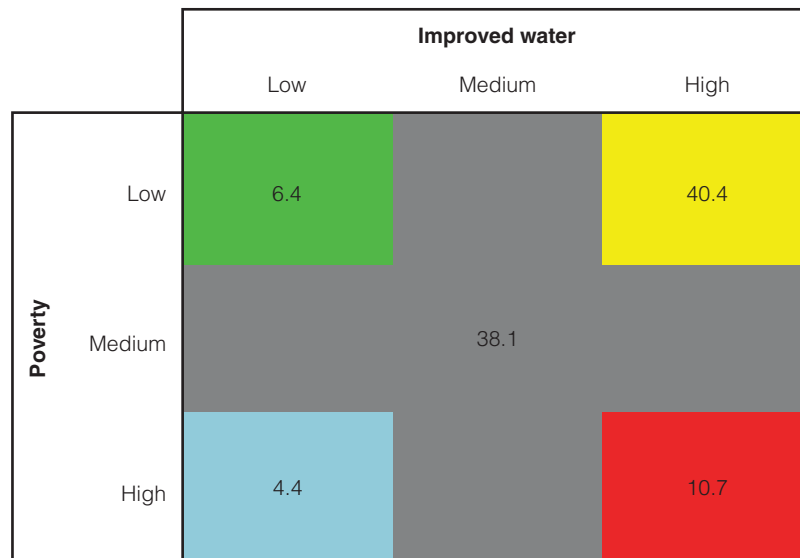
Source: World Bank calculations using NWSS 2015 data.
Note: This figure, based on data in map 2.4, shows the interaction between poverty and improved water, broken down by terciles. For example: "low-low" represents the percentage of the population who are both in the bottom tercile of access to improved water and in the bottom tercile of poverty.

A Blind Spot: Facility-Based WASH

Health-care facilities, schools, and work places desperately need safe WASH services. As part of the post-2015 global monitoring agenda, development agencies are expanding WASH monitoring beyond the household level and into community facilities where people spend a significant amount of time. Overall, data are sparse on WASH coverage beyond households. Among primary schools in *Bangladesh*, only 80 percent have access to improved water sources, and only 85 percent have at least one sanitation facility. The average student-to-toilet ratio is 100:1, double the national standard. About a third of health-care facilities experience routine water shortages, and the convenience of access is poor: only 27 percent of those in rural areas and 52 percent in urban areas have piped water on premises. Moreover, many health-care facilities also lack handwashing stations with soap and water. Among manufacturing enterprises with more than five employees, only 52 percent were found to have access to at least one toilet. In *Nigeria*, around 74 percent of public health centers have access to an improved water source, and 61 percent have access to improved sanitation on premises. Only 31 percent of public health-care facilities have a basic, functioning handwashing station. Around 42 percent of health centers have a separate sanitation facility for women and girls, and 6 percent have access to facilities for people with limited mobility. Improving the hygienic conditions of these health facilities is critical to reduce hospital and clinic infections.

Improving Data Quality and Collection

Reliable and consistent population surveys and extensive data on government expenditure and service provision are the cornerstones of solid, evidence-based policy making. Across the 18 economies studied, the WASH Poverty Diagnostic Initiative used all available, reliable datasets and collected new data where feasible. Among the datasets used are the Demographic Household Survey (DHS), the Multiple Indicator Cluster Survey (MICS), the Living Standards Measurement Study (LSMS), national household surveys, data from the International Benchmarking Network for Water and Sanitation Utilities (IBNET), expenditure information published by central banks, and other administrative data.

However, more work needs to be done to ensure that censuses and population surveys are conducted regularly, that data are released in a timely manner, and that the data collected are of the highest quality. A few observations emerged from the Initiative, specifically from in-country researc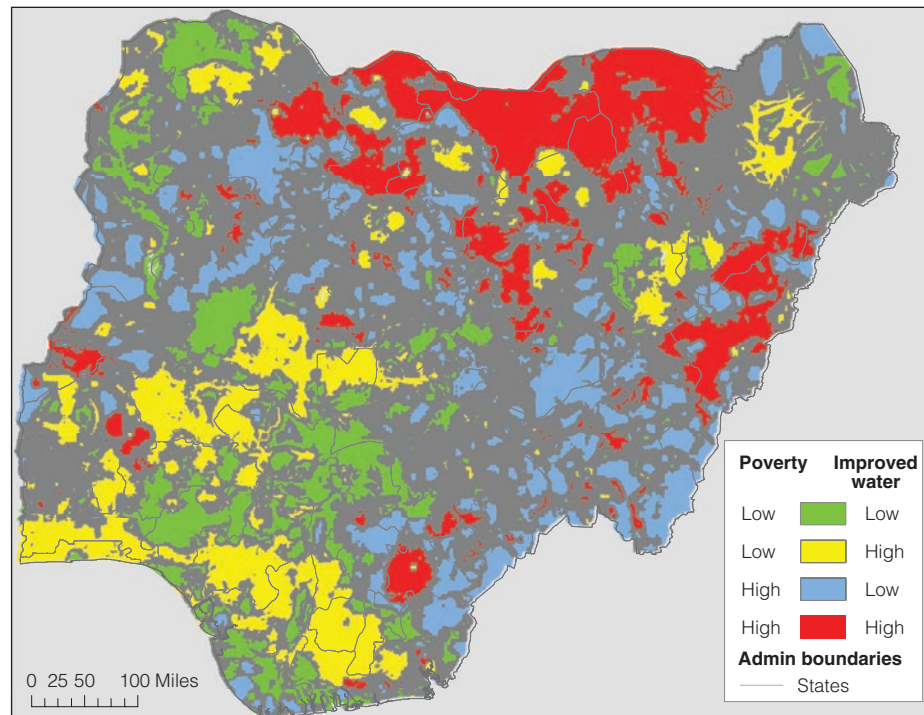h conducted with bureaus of statistics. The first observation is the need to harmonize questions across national surveys. This would make it possible to compare data across countries and would raise the integrity of any further research. Second, to effectively monitor progress, it is important to both retain questions relevant to the MDGs and to add questions specific to the SDGs. Bureaus of statistics require support in making the transition to the SDGs, and specifically in setting up cost-effective methods of monitoring the quality of water supply on a regular basis.[18] Third, the use of administrative data such as the data found on the International Benchmarking Network (IBNET) can enhance and triangulate data from other sources. Also, in some of the countries studied, the quality and availability of data on public accounts and national finances could be improved.

Inequalities in Access to WASH: Final Remarks

This chapter reviewed inequalities in access to WASH and how they intersect with the spheres of poverty, location, social category, and time. Acknowledging and understanding these inequalities is critical to developing priorities and policies to achieve the universal coverage that the SDGs are striving for. Among other findings, it can be observed that:

- Across countries, wealth is the most important factor in explaining access to WASH services.

- Access to improved water and sanitation services is higher in urban than rural areas.

- Countries suffer from regional disparities in access to WASH services.

- Women, ethnic minorities, and religious minorities have disproportionately low access to WASH services.

- Countries face challenges in ensuring equitable WASH services across the life cycle.

- Countries should continue to improve population surveys and the infrastructure for collecting data on, and documenting, service provision.

- Bureaus of statistics will require support from donor agencies to collect reliable and timely data and to combine those data with administrative sources to monitor the SDGs.

This chapter documented and quantified key inequalities in access to WASH services and highlighted several lesser-known patterns and facts that may provide keys to improving access. Acknowledging and understanding inequalities is critical to developing the priorities and policies needed to achieve the universal coverage called for in the SDGs.

Notes

1. Measures such as the percentage of households below the poverty line or below certain income and consumption thresholds.
2. The complete description of these findings is presented in Andres, Loughnan, and Li (2017). These categories overlap and are not mutually exclusive.
3. Ibid.
4. The JMP, co-led by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF), has been monitoring global progress toward the MDGs since 1990 and is responsible for reporting on SDG targets and indicators related to WASH.
5. Except for Ecuador, Tajikistan, the West Bank and Gaza, and Tunisia.
6. This MDG framework that has been a key part of efforts to build a better world for the past 15 years—challenged the global community to reduce by half the proportion of the population without basic drinking water and basic sanitation (JMP 2015).
7. Note that spatial aggregation in maps might be misleading, as argued by Gelman and Price (1999). In particular, large rural areas tend to have less access to services, including WASH. Correcting for this by using population density might add another problem, since areas with smaller populations have higher variance.
8. Another contribution of the WASH Poverty Diagnostics is their overlay of poverty and access maps. This was done in Nigeria, Niger, Tanzania, Ecuador, Panama, Tajikistan, Indonesia, Pakistan, and Ethiopia.
9. See Andres, Loughnan, and Li (2017) for a complete description of the findings summarized in this subsection.
10. An ethnic group is a category of people who identify with each other based on similarities, and is typically an inherited status based on the society in which a person lives.
11. Five circumstances we considered in this analysis: whether (i) the household lies in the B40 of the income distribution, (ii) the household is in a rural location, (iii) the household head is single, (iv) the household head is a female, and (v) whether the household head is educated. These factors mirror those used in previous studies to assess the inequality of opportunities. The choice of factors was done based on parameters that have shown to be associated with the use of WASH services, and are available and consistent across the countries covered under this initiative. These variables have also been shown to be associated with the use of WASH services, and they are of particular interest because they are circumstantial, that is, they cannot be controlled by a child.
12. In order to deal with the inequality overlaps across these factors, this report uses the Shapley decomposition to calculate the contribution of each circumstance, or factor, to the observed inequality of opportunity across households. The decomposition breaks down the R^2 of a regression based on the relative predictive share of each factor in determining

the effect of the outcome variable. So, by construction, the Shapley decomposition adds up to 100 percent. To calculate the impact of each circumstance, the Shapley decomposition takes the average of all possible changes to different combinations of circumstances to show how much inequality changes as a consequence of adding an additional factor (Biller, Andres, and Herrera Dappe 2014). Since circumstances correlate with each other, the change in inequality that results when a factor is added depends on the initial set of circumstances to which it is added.

13. Chapter 6 in the Nigeria WASH Poverty Diagnostic further (World Bank 2017a) discusses the functionality of water points and schemes.

14. Groundwater can be understood to be generally safer than surface water because it is less exposed to and can filter contaminants, particularly fecal bacteria. However, groundwater is not immune to issues of water quality. For instance, aquifers in many parts of the country contain elevated levels of naturally occurring arsenic, which may do grave harm to the health of people who consume it long term. Aquafers in low-lying nations on the front line of climate change are also vulnerable to another contaminant, salt water, as high tides surge inland over distances that are gradually increasing.

15. Fecal sludge is the contents contained in on-site facilities such as pit latrines and septic tanks, otherwise known as septage.

16. Map 2.4 shows the interaction between access to sources of improved water and poverty. For example: "low/low" is the percentage of households that are both in the bottom tercile of access to improved water and in the bottom tercile for poverty; "high/high" is the percentage of the population in the top tercile of access to improved water and in the top tercile for poverty. This analysis was also conducted in Niger, Tanzania, Ecuador, Panama, Tajikistan, Indonesia, Pakistan, and Ethiopia.

17. To further flesh out the factors in the poverty–WASH nexus, this report explored differences in socioeconomic factors for households that were geographically located near one another and exhibited the same poverty levels, but that experienced different levels of access to improved water and sanitation. A geographic buffer was generated to capture households living in areas with high rates of poverty and high rates of access and households living in areas with high rates of poverty but low rates of access that were within 50 kilometers of one another. This was done under the assumption that it is more accurate to compare households that are located close to one another, since they are more likely to share greater similarities across baseline geographic characteristics. Across poverty-access tiers, households are concentrated in a handful of states, which suggests that there are state-level factors driving differences in access.

18. See blogpost: http://blogs.worldbank.org/water/category/countries/ecuador.

References

Andres, L., and D. Cubas. 2017. "Human Opportunities Index in Water, Sanitation, and Hygiene." Background paper for the WASH Poverty Diagnostics Initiative, World Bank, Washington, DC.

Andres, L., E. Loughnan, and S. Li. 2017. "Navigating the Shifting International MDG to SDG Frameworks to Assess WASH Coverage in 18 Countries in a Meaningful Way." Background paper for the WASH Poverty Diagnostics Initiative, World Bank, Washington, DC.

Andres, L., L. Inha, and P. Getthing. 2017. "Developing Rural Drinking Water Accessibility Index—A Tool for Policy and Planning." World Bank, Washington, DC. Forthcoming.

Biller, D., L. Andres, and M. Herrera Dappe. 2014. "Infrastructure Gap in South Asia: Infrastructure Needs, Prioritization, and Financing." Policy Research Working Papers Series 7032, World Bank, Washington, DC.

Gelman, A., and P. Price. 1999. "All Maps of Parameter Estimates Are Misleading." *Statistics in Medicine* (18): 3221–34.

UNICEF (United Nations Children's Fund). 2017. "Disability and Access to Latrines." U Report, Nigeria Voice Matters, UNICEF, January 18. http://nigeria.ureport.in/poll/1764/.

WHO/UNICEF (World Health Organization/United Nations Children's Fund). 2013. "Post 2015 WASH targets and indicators." Joint Monitoring Programme. Geneva: World Health Organization, and New York: UNICEF.

WHO/UNICEF JMP (Joint Monitoring Programme). 2015. "Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment." JMP, WHO and UNICEF, Geneva.

World Bank. 2014. "The Missing Link in Sanitation Service Delivery: A Review of Fecal Sludge Management in 12 Cities." Water and Sanitation Program, Research Brief, April 2014, World Bank, Washington, DC. https://www.wsp.org/sites/wsp.org/files/publications/WSP -Fecal-Sludge-12-City-Review-Research-Brief.pdf.

———. 2017a. *WASH Poor in a Water-Rich Country: A Diagnostic of Water, Sanitation, Hygiene, and Poverty in the Democratic Republic of Congo*. WASH Poverty Diagnostic. World Bank, Washington, DC.

———. Forthcoming(a). *Maintaining the Momentum while Addressing Service Quality: A Diagnostic of Water Supply, Sanitation, Hygiene, and Poverty in the Federal Democratic Republic of Ethiopia*. WASH Poverty Diagnostic. World Bank, Washington, D.C.

———. Forthcoming(b). *A Destiny Shaped by Water: A Diagnostic of Water Supply, Sanitation, Hygiene, and Poverty in Niger*. WASH Poverty Diagnostic. World Bank, Washington, D.C.

———. 2017b. *A Wake Up Call: Nigeria Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. World Bank, Washington, DC.

Chapter 3
All Hands on Deck: Working Together to Protect the Foundations of Development

Chapter 2 discussed inequalities in access to water supply, sanitation, and hygiene (WASH) services across various domains. Chapter 4 will consider how limited WASH resources are allocated and the implications of those allocations for efforts to address inequalities in WASH services. While much of this report focuses on targets 6.1 and 6.2 of the Sustainable Development Goals (SDGs, see chapter 1), this chapter will discuss WASH's potential contributions to accelerating progress toward SDG 2, "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; and SDG 3, "Ensure healthy lives and promote well-being for all at all ages." (See box 3.1.) This chapter will argue that continuing to do business as usual will not contribute much to child health outcomes or stop the intergenerational transfer of poverty (also known as the poverty trap). This idea is supported by the United Nations Platform on Social Determinants of Health, which states that health equity cannot be achieved by acting in the health sector alone; that actions in other sectors—including water—are critical (WHO 2015).

Why WASH Matters for SDGs 2 and 3

If WASH investments are to speed progress toward SDGs 2 and 3, the prevalence of childhood diarrheal disease and undernutrition must be factored in when allocating scarce resources at the national and subnational levels. If the goal is, indeed, to "ensure healthy lives," then the focus must first be on young children. Although the correlation between monetary poverty and children's health is clear enough at the country level of analysis, it cannot be simplified to map directly to the poor/non-poor and rural/urban binaries outlined in chapter 2. Not all children in poor households or in rural areas are undernourished or suffering from diarrheal disease, and, in many countries, not all children in non-poor households or in urban areas are well nourished or free from diarrheal disease. As a result, targeted WASH investments in rural areas where diarrhea and stunting are prevalent are likely to accomplish more than efforts to achieve universal coverage by reducing the WASH gaps between poor and rich, rural and urban.

Breaking the Poverty Trap: Why Basic Services Matter

Children who lack access to WASH services in the initial stages of life pay dearly—and these costs are eventually borne by the rest of society. The primary cost is immediate: poor access to water and sanitation is associated with an increase in the incidence of undernutrition and diarrheal disease. But there are also important consequences in the long term—both to the individual and society—associated with the chronic undernutrition of children: a high risk of stunting, impaired cognitive development, lower rates of school attendance, reduced human capital attainment, and a higher risk of chronic disease and health problems in adulthood (Victora et al. 2010). Thus, inequities in access to WASH and other services early in the life of a child further the intergenerational transmission of poverty.

Too often, inadequate WASH services leave children exposed to a wide range of pathogens and consequent health problems. The ingestion of contaminated water, food, or soil as a result of the unsafe management of human excreta, a contaminated or inadequate water supply, and/or inadequate personal and domestic hygiene provide routes of transmission for numerous microorganisms that can cause diarrhea and other severe infections.[1] Enteric pathogens in particular[2] not only cause diarrhea but can also lead to chronic difficulty absorbing nutrients. This, in turn, can lead to both stunting and wasting (that is, being underweight).

The World Health Organization's (WHO 2014) current estimate of the impact of inadequate WASH services is 58 percent of total diarrheal deaths. Together, inadequate services in low- and middle-income countries are estimated to be responsible for more than 800,000 deaths annually (WHO 2014). Despite great progress in reducing diarrheal mortality worldwide, diarrhea, along with lower respiratory infections, remains the third-leading cause of death in developing countries and the second-leading cause of death in children under 5.[3]

The burden of WASH-related neglected tropical diseases (NTDs[4]) in the 18 economies covered by the WASH Poverty Diagnostic Initiative is estimated to be 9,187,380 disability-adjusted life years (DALYs) (IHME 2015)—nearly 70 percent of the total DALYs attributed to all NTDs worldwide. India and the Democratic Republic of Congo constitute almost half of all WASH-related NTDs in these countries—2,646,525 DALYs and 2,576,295 DALYs, respectively. The other half is distributed among Nigeria, Indonesia, Ethiopia, Pakistan, Mozambique, and Bangladesh (figure 3.1).

Developed and used by the WHO's Global Burden of Disease project, DALYs are a common health metric that combines both the years of life lost (YLL) due to a particular cause or risk factor as well as the years lived with disability. A single DALY can be considered as one year of healthy life lost. DALYs are used to provide a summary estimate for the distribution of the diarrheal (or enteric) disease burden attributable to inadequate WASH services, calculated across different subsets of the population.

Figure 3.1: Disability-Adjusted Life Years Caused by WASH-Related Neglected Tropical Diseases, 2015
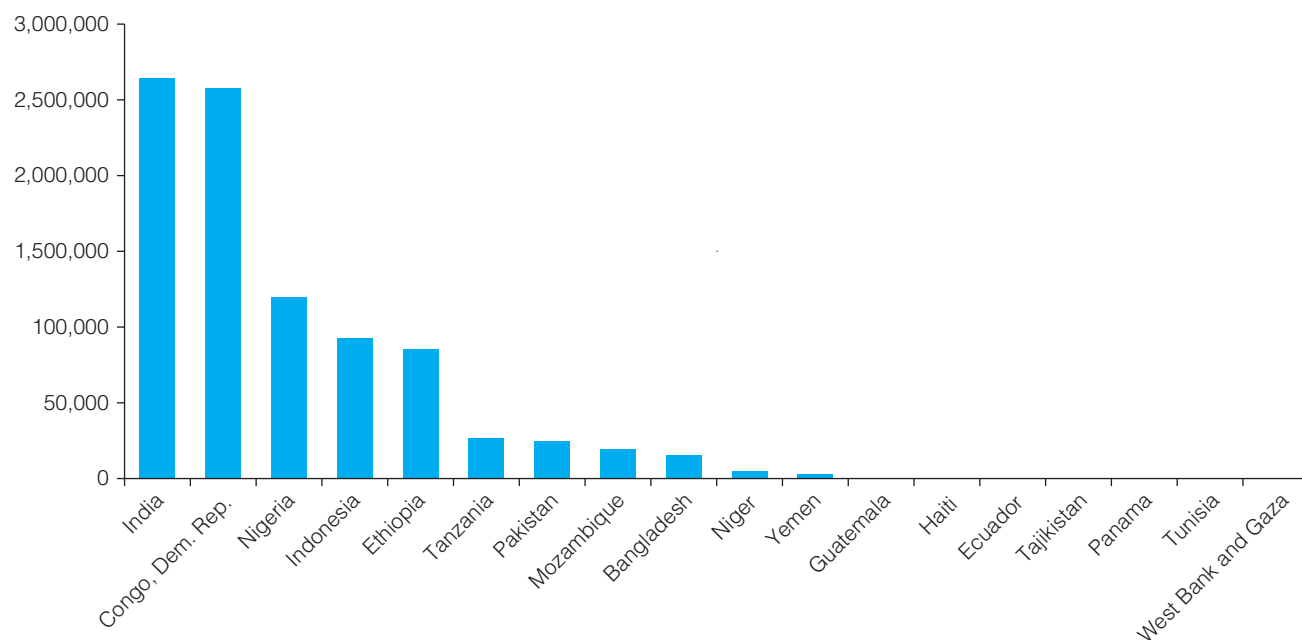
Source: World Bank calculations.

Figure 3.2: The Causes, Correlates, and Consequences of Stunting
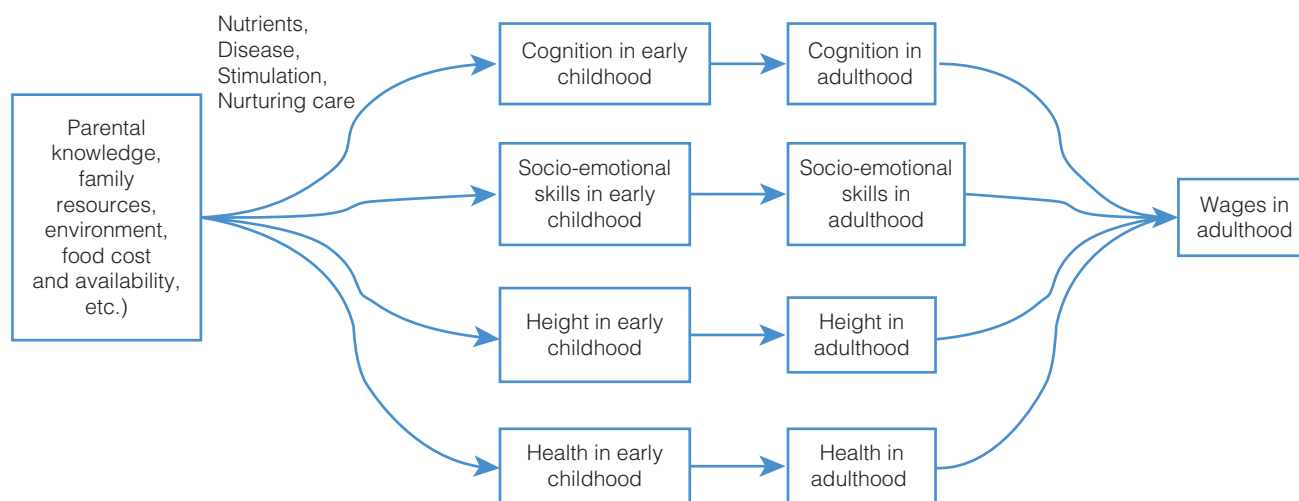
Source: Galasso et al. 2017.

In 2014, 171 million children under the age of five had stunted growth, meaning that they were excessively short for their age.[5] Children whose early growth is stunted suffer a long-term failure to grow, reflecting the cumulative effects of early chronic deficits in food intake and proper nourishment, poor health-care practices, exposure to an unsafe and nonhygienic environment, and illness. The negative outcomes later in life, some of which can be quantified in economic terms, are numerous (figure 3.2).

Recent World Bank estimates suggest that the per capita income penalty a country incurs for not having eliminated stunting when today's workers were children is around 7 percent of gross domestic product (GDP) per capita, on average. In Sub-Saharan Africa and South Asia, these figures rise to about 9–10 percent of GDP per capita (Galasso et al. 2017).

Comparing Stunting Rates between and within Countries

The country reports carried out under the WASH Poverty Diagnostic Initiative highlight not only the variability in stunting rates between countries (figure 3.3), but also the large differences *within* **countries, particularly by location (rural or urban) and by level of household wealth (poor or non-poor).** While in *Haiti* and *Bangladesh* the difference between urban and rural stunting rates is only 2 percentage points, in *Guatemala* it is 17 percentage points (figure 3.4). Overall, children in non-poor households—those in the top 60 percent (T60) of the wealth distribution— are less likely to be stunted than children from poor households—those in the bottom 40 percent (B40) of the wealth distribution.

However, there are large disparities as to the degree of the gap. In *Guatemala*, the difference is 21 percentage points, whereas in *Niger* it is 4 percentage points. Where the national stunting rate is low, differences between different subpopulations are not necessarily small. Although *Tunisia* has the lowest stunting rate of the countries considered, the spreads between urban and rural children and between children in poor and non-poor households are greater than in countries with far higher stunting rates.

What Will it Take to Address Undernutrition?

What will it take to address undernutrition? Closer integration of WASH investments with investments in related sectors is the key to solving the problem of undernutrition.

Figure 3.3: Prevalence of Stunting in Children under 24 Months, Selected Countries
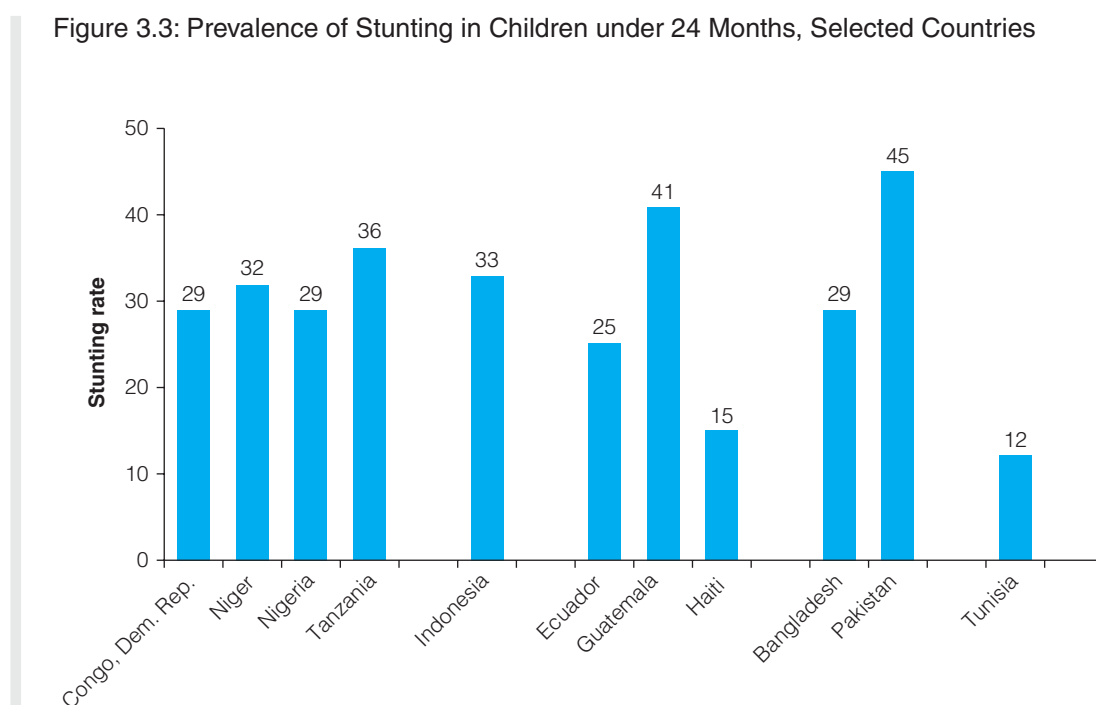
Source: Skoufias and Vinha 2017.

Figure 3.4: Differences in Stunting Rates, by Location and Household Wealth, Selected Countries

a. Rural / Urban

(Chart showing stunting rates by Rural/Urban for selected countries)

Country	Rural	Urban
Pakistan	48	37
Guatemala	47	30
Indonesia	37	30
Tanzania	37	29
Niger	33	23
Congo, Dem. Rep.	32	21
Ecuador	31	23
Bangladesh	29	27
Haiti	16	14
Tunisia	16	10

Stunting rate (y-axis: 0–50)

● Rural ● Urban

b. Wealth (B40 vs. T60)

(Chart showing stunting rates by wealth group B40/T60 for selected countries)

Country	B40	T60
Pakistan	56	36
Guatemala	51	30
Tanzania	40	33
Indonesia	38	31
Niger	34	30
Bangladesh	33	28
Congo, Dem. Rep.	32	28
Tunisia	20	10
Haiti	19	12

Stunting rate (y-axis: 0–60)

● B40 ● T60

Source: Skoufias and Vinha 2017.
Note: B40 = bottom 40 percent of asset wealth distribution; T60 = top 60 percent of asset wealth distribution.

In recent years there has been a significant increase in the number of initiatives, both global and national, to address the nutritional needs of underserved populations from several angles at once. As outlined by a United Nations Children's Fund (UNICEF) conceptual framework (UNICEF 1990), the ultimate success of such multisectoral efforts depends on how they address inequalities in access to four key factors that determine good health and nutrition over the long term (figure 3.5). These are (i) food security, (ii) adequate personal care and feeding practices, (iii) a healthy environment (or WASH), and (iv) adequate health-care services.

The effectiveness of WASH interventions and their ultimate success in furthering progress toward the SDGs depend on a holistic view of the inequalities and gaps in access to these factors, which, as the underlying determinants of good nutrition and long-term well-being, are usually beyond the consideration of any one sector. For example, efforts to promote the cultivation of micronutrient-rich fruits and vegetables in home gardens typically have no control over access to water. But what if key agricultural interventions were to be accompanied by simultaneous improvements in water and sanitation facilities in the same communities? Working together rather than in isolation, sector actors could better address the underlying determinants of nutrition.

How inequities overlap, or not, is also important to consider. Thus, the effects of inadequate WASH services—as measured by, say, the prevalence of stunting—may be strongest in areas deprived of access to services from other sectors. Child nutrition is, in general, the byproduct of complex interactions among a host of factors. These include access to water and sanitation, parental income and education levels (especially mothers and caregivers), access to health facilities, and food security, to name a few.[6] Say, for instance, that a child without access to adequate WASH services contracts giardia. If he has access to appropriate treatment, such as oral rehydration therapy (ORT) or antibiotics, this mitigates the negative impact of the inadequate WASH services.

The WASH Poverty Diagnostic Initiative sheds new light on how inequalities in access to WASH interact with inequalities to other services critical to child nutrition. Understanding this is crucial

Figure 3.5: Determinants and Consequences of Maternal and Child Undernutrition

	Intergenerational consequences	
Short-term consequences: Mortality, morbidity, disability	**Long-term consequences:** Adult height, cognitive ability, economic productivity, reproductive performance, overweight and obesity, metabolic and cardiovascular diseases	

Maternal and child undernutrition

IMMEDIATE causes: Inadequate dietary intake — Diseases

UNDERLYING causes: Household food insecurity | Inadequate care and feeding practices | Unhealthy household environment | Inadequate health services

Household access to adequate quantity and quality of resources: Land, education, employment, income, technology

BASIC causes: Inadequate financial, human, physical and social capital

Social cultural, economic and political context

Source: Adapted from UNICEF 1900.

when prioritizing sectoral policies in the context of limited budgets and other binding constraints. Two related but distinct conceptual approaches were applied at the country level to subsets of the 18 countries studied. The first is a variant of the original UNICEF model of undernutrition (UNICEF 1990; Black et al. 2013). This allows for a holistic view of the interdependence of the various sectors relevant to child nutrition. The second approach is the WASH Poverty Risk Model (WASH-PRM).[7]

The two approaches provide complementary information. The holistic view provided by the variant of the UNICEF framework lays the groundwork for more effective multisectoral action by providing decision makers with the opportunity to assess the potential impact of nutrition-sensitive investments across different sectors such as water and sanitation, agriculture, social protection, health, and education. This framework for operational guidance and prioritization helps identify particularly important gaps (for example, in water or sanitation) that, if addressed, might serve to strengthen the impact of nutrition-sensitive interventions in other sectors. The WASH-PRM, meanwhile, is better equipped to inform WASH-specific decisions by revealing how inadequate water and sanitation might combine with inadequate health care to produce a disproportionate risk for the populations concerned. It is important to bear in mind that both of the approaches employed are primarily useful for summarizing correlations rather than identifying causes.

Access to the Factors Underlying Nutrition: The View from Above

Very few children have simultaneous access to adequate levels of all four of the determinants of long-term health described in the first paragraph of this section. In fact, a great number of children do not have access to even one. In-depth country-level analysis based on the variant of the UNICEF conceptual framework was carried out for 11 of the 18 countries for the four determinants based on data from the most recent Demographic and Health Surveys (DHS) conducted between 2009 and 2015. Each indicator is composed of various subcomponents, based on availability, with the definition of "adequate" based on national or accepted international standards.[8] Based on the data available, using a strict definition for what constitutes access to adequate care or health or environment or food,[9] a stark picture emerges of the extent to which children have simultaneous access to two or more of the four underlying determinants of nutrition. In the countries studied, less than 3 percent of children under the age of two had access to all four of the determinants and in fact, in six countries effectively no child has access to all four (figure 3.6).[10] In fact, except for *Tunisia*, only about one-fifth of the children have access to any of the four determinants. In three of the eleven countries, *at least half* of the children do not have access to adequate levels of even *one* of the four, which are referred to from here on as drivers of nutrition.

The very small proportions of children with simultaneous access to more than one of the drivers of nutrition suggests that isolated efforts to improve access in one sector may be limited or vitiated by inadequate access levels in another. Research on sector-specific interventions (World Bank 2013) rightly emphasizes the synergies that can be exploited *within* specific sectors such as WASH, agriculture, or social protection. These findings suggest that the success of uncoordinated or isolated initiatives may be limited. Extrapolating this finding across sectors, coordinated and simultaneous multisectoral interventions covering the same geographic areas or groups of children with high stunting rates may yield synergies that will effectively reduce undernutrition.

Figure 3.6: Beneficial Effects of Simultaneous Access to Multiple Drivers of Nutrition
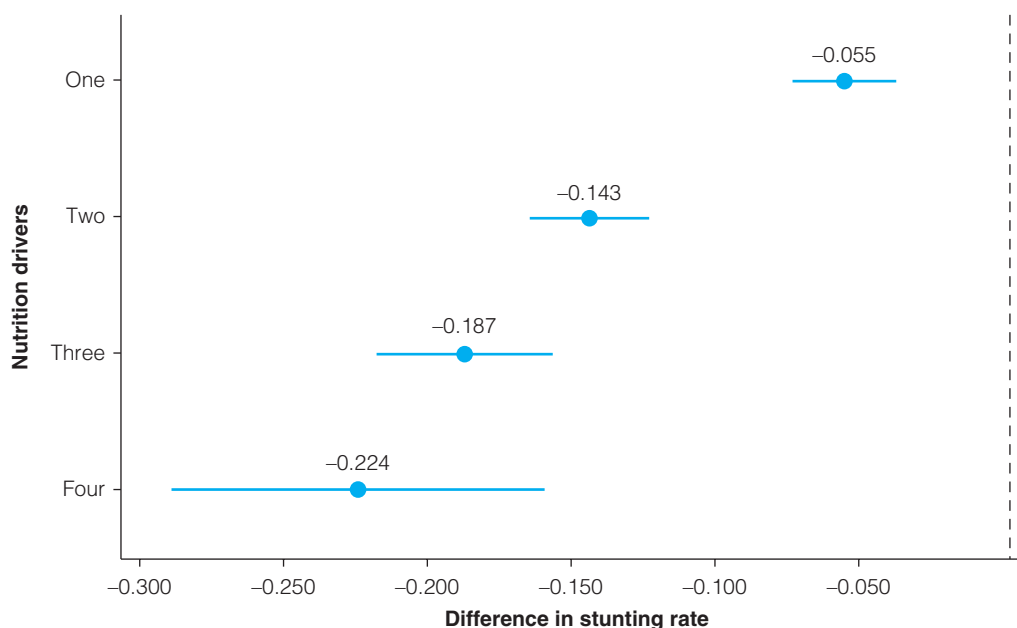
Source: Skoufias and Vinha 2017.
Notes: Author calculations, country fixed effects, clustered SE. Showing point estimates and 95% CI.

Stunting and Simultaneous Access to the Drivers of Nutrition

Children with simultaneous access to adequate levels of one (or more) of the four drivers of nutrition are less likely to be stunted than children who have access to none. First, children with access to one driver are statistically significantly less likely to be stunted than those children without access to any nutrition driver (figure 3.7). Those with simultaneous access to two are also less likely to be stunted than those with access to just one.[11] And those with access to all four are less likely to be stunted than those with access to just two or three.[12] In fact, the point estimates suggest that the highest percentage point decline (8.8 percentage points) in stunting occurs between children with access to two drivers and those with access to only one (-0.143 + 0.055 = -0.088). The decline in stunting observed between other groups of children ranges from 5.5 percentage points (those with access to only one driver relative to those with access to none) to 3.7 percentage points (access to three drivers vs. access to two). These results suggest that the four drivers are not substitutes for one another, and that simultaneous access to adequate levels of two or more of the nutrition drivers is associated with lower stunting.

Access to only one of the four drivers of nutrition is associated with a lower probability of stunting, with access to WASH services making the largest difference. In the pooled sample, access to adequate WASH services but not to the other three drivers is associated with a decrease in stunting of about 10.4 percentage points relative to the stunting rate prevailing among children without access to any of the four drivers (figure 3.8). Access to adequate food only is associated with about an 8.3 percentage point decrease in the probability of being stunted. Access to adequate health care only or to adequate personal care and feeding practices only is associated with 1.5 and 3.8 percentage point decreases in the probability of stunting, respectively.

Figure 3.7: Difference in the Probability of Being Stunted, by Simultaneous Access to Drivers of Nutrition
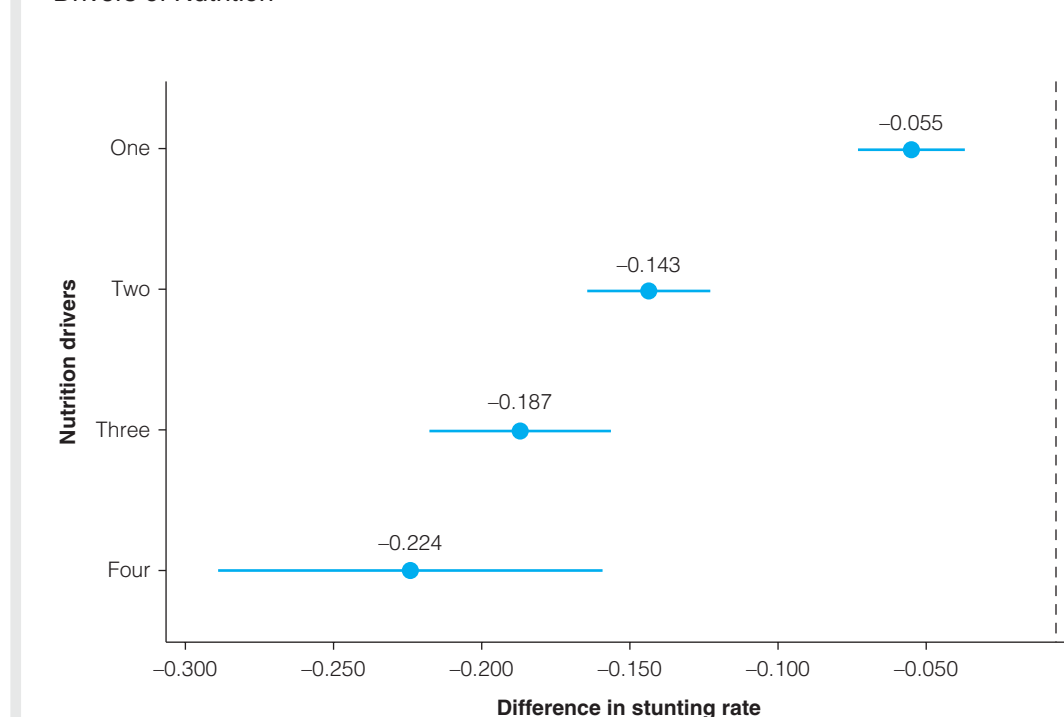
Source: Skoufias and Vinha 2017.
Notes: Regression estimates based on pooled data from seven countries: Bangladesh (2014), the Democratic Republic of Congo (2013), Guatemala (2009), Haiti (2012), Niger (2012), Pakistan (2012), and Tanzania (2010). Regression included country-level fixed effects, and standard errors were corrected for correlation within clusters.

Figure 3.8: Difference in the Probability of Being Stunted, by Simultaneous Access to Drivers of Nutrition

Source: Skoufias and Vinha 2017.
Note: Regression estimates based on pooled data from seven countries: Bangladesh (2014), the Democratic Republic of Congo (2013), Guatemala (2009), Haiti (2012), Niger (2012), Pakistan (2012), and Tanzania (2010). Regression included country-level fixed effects, and standard errors were corrected for correlation within clusters. C = personal care and feeding practices; F = food; H = health care; W = water supply, sanitation, and hygiene.

If a child has simultaneous access to WASH services and to one or more of the other drivers, then she is less likely to be stunted than a child that does not have access to adequate WASH only. Children that have access to WASH services plus other drivers (figure 3.8)—such as simultaneous access to adequate WASH services combined with adequate food (WF) or adequate WASH services combined with adequate health care (WH)—are associated with greater reductions in the probability of being stunted than those not having access to adequate levels of any of the drivers or those having access to adequate WASH services only. In fact, simultaneous access to WASH services and health care together (WH) appears to halve the probability of being stunted compared with access to WASH alone, a decrease roughly comparable to that observed with simultaneous access to WASH, food, and health (WFH), or WASH, food, health, and care (WFCH).

Synergies between WASH and Health

The estimates outlined above also provide evidence of potential synergies between simultaneous investments in improved WASH and health services. Consider the set of comparisons labeled "W&H" in figure 3.9. The bars estimate the reduction in stunting when children have access to adequate WASH services only (blue portion of first bar) and access to adequate health care only (dark blue portion)—and compares them with access to both at once (the adjacent aqua blue bar), taking as a baseline *no* access to adequate levels of any of the four drivers of nutrition. The longer length of the aqua blue bar suggests that simultaneous investment coordinated across the water and health sectors creates synergies, with effects greater than the sum of the parts.[13]

Thus, the reductions in stunting that can be accomplished when children have simultaneous access to adequate WASH services and health care (WH) are greater than the reductions in stunting achieved by providing some children with adequate WASH services only and a different group of children with adequate health services only. Similar synergies also appear to be

present between simultaneous access to adequate health care and food (H&F). No synergies appear to be present with simultaneous access to adequate WASH services and food (W&F) or with adequate WASH and personal care and feeding practices (W&C).

Simultaneous access to multiple drivers of nutrition can be brought about by multisectoral collaboration. An example from Brazil appears in box 3.2.

Figure 3.9: Reductions in Stunting Associated with Uncoordinated vs. Simultaneous Interventions
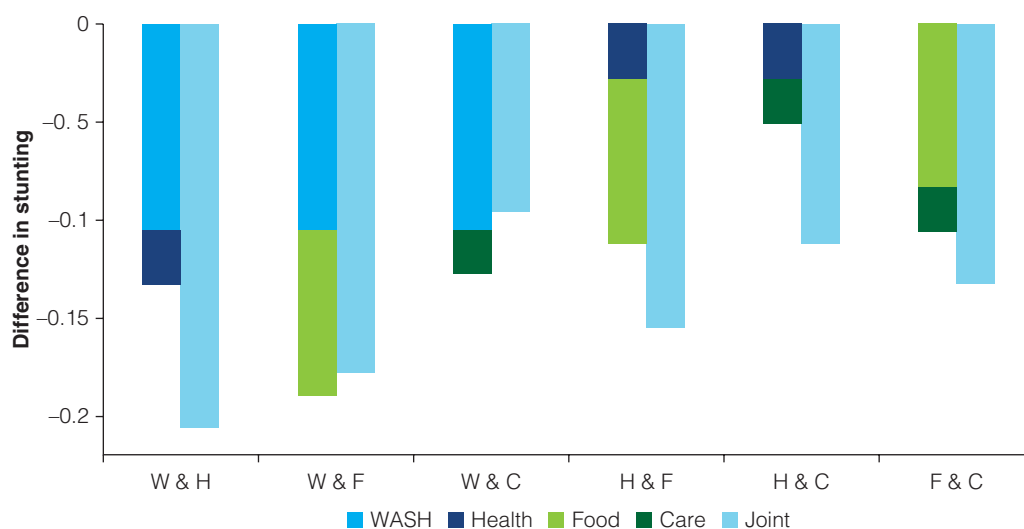
Source: Skoufias and Vinha 2017.
Note: Regression estimates based on pooled data from seven countries: Bangladesh (2014), the Democratic Republic of Congo (2013), Guatemala (2009), Haiti (2012), Niger (2012), Pakistan (2012), and Tanzania (2010). Regression included country-level fixed effects, and standard errors were corrected for correlation within clusters. C = personal care and feeding practices; F = food; H = health care; W = water supply, sanitation, and hygiene (WASH).

Box 3.2: Putting Multisectoral Planning into Action—An Example from Brazil

Between 2003 and 2008 the State of Bahia in Brazil made significant progress across multiple health indicators for its population but was not reaching its targets for infectious intestinal disease—that is, diarrhea in children under 5 (50,000 hospitalizations per year) and reductions in low birth weight. Both indicators were key contributors to the state's elevated infant mortality rate, which stood at 24 deaths per live births in 2008.

In response, the World Bank helped the government develop a multisectoral health and water project between 2010 and 2016. The project's goals were to reduce post-neonatal morbidity and mortality due to infectious intestinal disease in children below one year of age and to reduce neonatal mortality (children younger than 28 days)

box continues next page

in 25 selected hospitals of the state. The project included five sectors: health, water, sanitation, public management, and planning, and was under the administration of the secretary of financing (SEFAZ).

The project identified the 10 municipalities with the largest incidence of diarrhea and the worst drinking water and sanitation infrastructure. A series of interventions (i) increased the number of people served with simplified water supply systems and basic sanitation from 32,295 to 72,295; (ii) trained 800 community health agents in environmental control, hygiene, and water and sanitation management; (iii) used scorecards and incentives to improve household sanitation and hygiene behaviors by setting "green hygiene family goals"; (iv) improved monitoring of water quality along with river basin planning; (v) increased the coverage of family health teams from 53 percent to 70 percent of the population; and (vi) increased rotavirus vaccination in children below one year from 57 percent to 82 percent. Twenty-five hospitals were targeted to raise the quality of treatment of cases of diarrhea. Key aspects of the project were performance agreements and result-based disbursement systems.

This multisectoral project was a major success for the State of Bahia. From 2008 to 2015, the state observed a 70 percent reduction in hospitalizations for diarrhea of children under the age of five, along with a 40 percent reduction in the infant mortality rate in the state (figures B3.2.1 and B3.2.2). As a result, the organizational culture of working with common multisectoral objectives was rapidly incorporated by the state, and extended to other geographic areas.[a]

Figure B3.2.1: Hospitalization of Children under the Age of Five because of Diarrhea, 2008–15
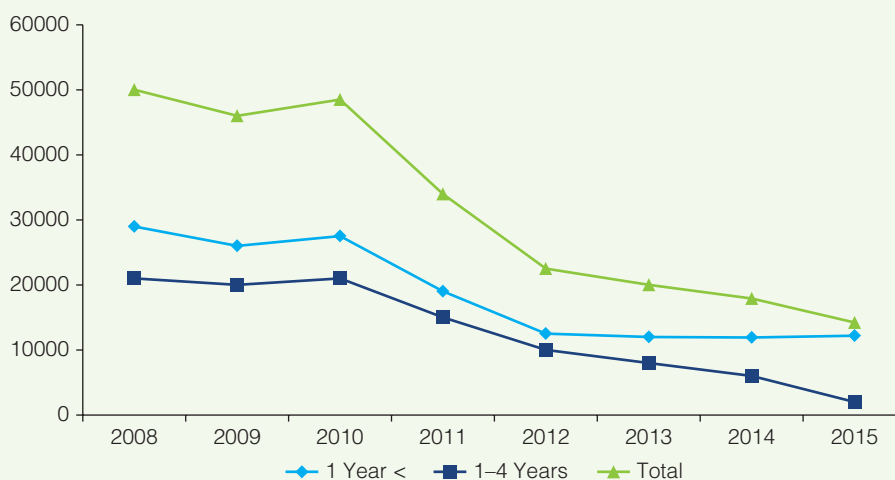
Source: SIH/SUS/DATASUS, and World Bank project report.

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Figure B3.2.2: Reduction of the Rate of Infant Mortality in the State of Bahia, 2008–15
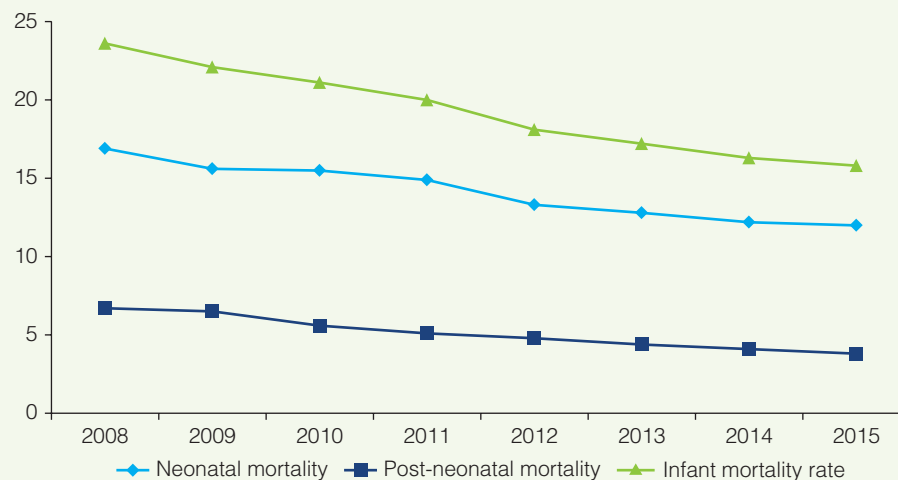
Source: SIH/SUS/DATASUS, and World Bank project report.
Note: a. On July 12, 2012, KPMG published the results of an independent competition (KPMG had no involvement in the judging process) to select the 100 most innovative and inspiring projects in the world. The multisectoral Bahia project was selected as one of 10 by an independent panel of experts from five regions.

A New Tool to Support Water and Sanitation Decision Making

A new model employed by the WASH Poverty Diagnostic Initiative is specifically equipped to support water and sanitation decision making. The WASH-PRM (summarized in box 3.3) examines how inadequate water and sanitation can combine with inadequate health care to produce a disproportionate risk for people living in poor or marginalized areas. Unlike the UNICEF conceptual framework that spans multiple sectors affecting nutrition, this model focuses on a few key factors (only some of which can be shaped by actions in other sectors, such as health) that influence a child's risk of dying from diarrheal disease (see Cumming et al., forthcoming and appendix B). These factors include a child's nutritional status, access to vitamin A, and oral rehydration treatment. An exposure index and a susceptibility index are estimated and combined for each child using DHS data (box 3.3), which produces an overall risk index (as a product of the former two indices). The values of these indices for each child can then be aggregated for different geographic areas (for example, regions or provinces within a country) and different socioeconomic groups (for example, children in households in the B40 vs T60 of the wealth distribution) to guide new investments by the water sector.

The rest of this section highlights useful examples of how the model has been applied in some of the countries covered by the Initiative to identify priority areas and socioeconomic groups where new investments in the WASH sector might produce the greatest benefits in terms of reducing the risk of diarrheal infection and reducing stunting. The same model was applied to nine countries in total—Bangladesh, the Democratic Republic of Congo, Ethiopia, Haiti, Mozambique, Nigeria, Pakistan, Ecuador, and Tajikistan. These countries were not intended to

Box 3.3: The WASH Poverty Risk Model

The model combines key **susceptibility factors** and **exposure factors** that are most relevant to the following health outcomes: diarrhea, stunting, and mortality. The **exposure factors** include WASH-related elements that influence the risk of diarrheal disease (figure B3.3.2). Three risk factors related to **susceptibility** include: micronutrients (vitamin A), effective treatment (oral rehydration therapy, or ORT), and undernutrition/ underweight (assessed by a child's weight-for-age). **The relative risk** associated with these exposure and susceptibility factors represents the level of disease risk among exposed individuals—that is, those with a particular risk factor (for example, *not* having safe drinking water)—compared with unexposed individuals without the same risk factor. A relative risk value *greater* than 1.0 indicates that the exposed are at greater risk of contracting than the unexposed, and a value *less* than 1.0 indicates that the risk is similar. Relative risk estimates are derived from pooling effect sizes from assessments of the effect of a given factor on a given disease, such as the effect of safe drinking water on diarrheal disease.

The risk results from the WASH Poverty Risk Model (WASH-PRM) can then be translated into commonly used measures of Disability-Adjusted Life Years (DALYs), developed and used by the World Health Organization's Global Burden of Disease project. DALYs are used to provide a summary estimate of the distribution of the enteric disease burden attributable to inadequate WASH services, calculated across different subsets of the population. Figures B3.3.1 and B3.3.2 illustrate the conceptual framework. Appendix B provides more detail.

Figure B3.3.1: Conceptual Framework for Water and Sanitation Disease Risk Model
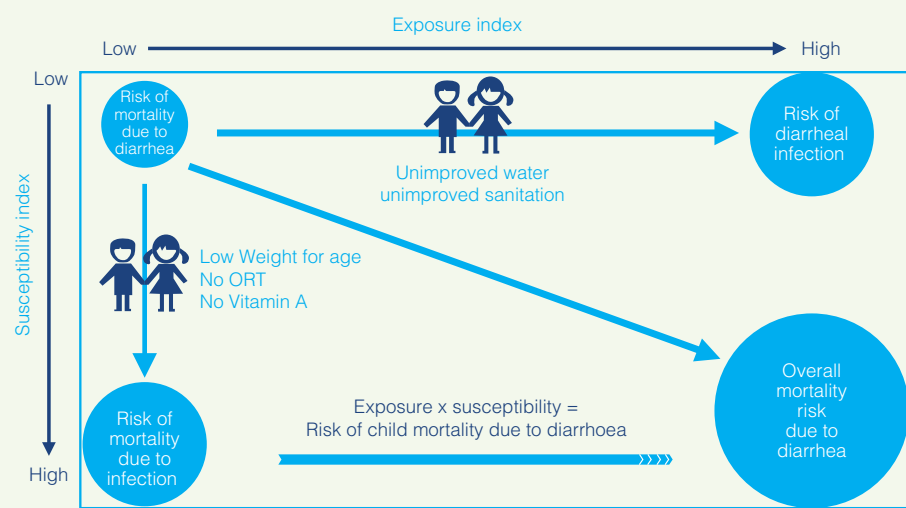
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Figure B3.3.2: Risk Factors of Diarrheal Mortality
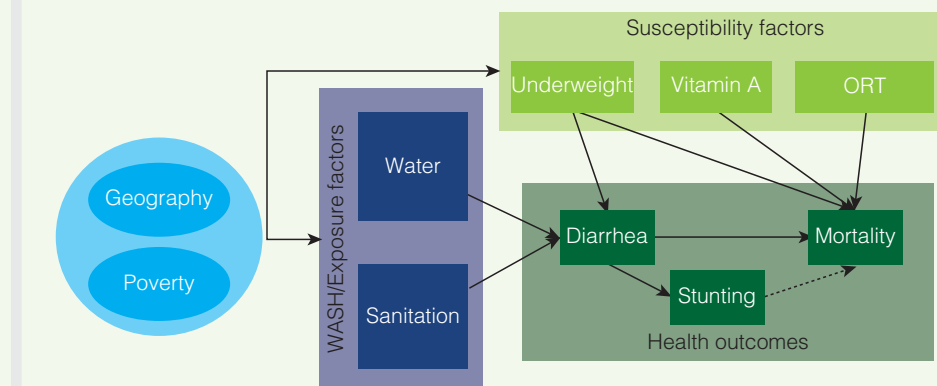
Source: Cumming et al., forthcoming and appendix B.
Note: ORT = oral rehydration therapy.

be statistically representative, but rather were selected on the basis of interest expressed by World Bank country teams.

For WASH dollars to have the greatest impact on reducing the risk of child mortality from diarrheal disease, they need to target geographic areas having little access to services and otherwise vulnerable populations. One of the main benefits of the WASH-PRM is its quantification of overall disease risk and of disparities in this risk across subnational and wealth-level divisions. As an example, Map 3.1 highlights the spatial distribution in *Mozambique* of the exposure index associated with inadequate WASH services and the susceptibility index of the factors that amplify or weaken the impacts of inadequate WASH services. A high value of the exposure index implies poor WASH, while a high value of the susceptibility index implies high vulnerability. The risk index, which is a combination of the exposure and susceptibility indices, highlights the provinces where children are at most risk of dying from diarrheal disease. Children with the highest risk index values are concentrated in the northern provinces, with children from Cabo Delgado, Zambezia, and Tete being particularly vulnerable to disease risk (highlighted in dark red).

One particularly useful finding of provincial maps such as the ones in Map 3.1 is that geographic targeting based simply on poor WASH services (high exposure index) may not be the most effective in terms of reducing diarrhea. Although Mozambique's Nampula Province has a high exposure risk (meaning poor water and sanitation facilities), its lower susceptibility risk keeps it from being particularly vulnerable to overall disease. In contrast, the Cabo Delgado, Zambezia, and Tete provinces appear to have both high exposure and high susceptibility risks, resulting in a higher overall disease risk. Analogous provincial maps in the country studies carried out under the WASH Poverty Diagnostic Initiative are similarly revealing.

The risk results from the WASH-PMR can also be translated into DALYs (introduced in section 3.1). Map 3.2 provides a summary estimate of the disease burden in *Nigeria*, by region, as measured in DALYs. Children from the northwest and northeast regions are seen to have higher DALY rates, and thus a greater total disease burden across the wealth distribution.

Map 3.1: Exposure to Inadequate WASH and Susceptibility Factors Combined Increase Risk of Child Mortality Due to Diarrhea in Mozambique

Exposure index

Overall

<2.4
2.4–2.6
2.6–2.8
>2.8

Susceptibility index

Overall

<0.5
0.5–1.0
1.0–1.5
>1.5

Risk index

Overall

Cabo
Delgado

Tete

Nampula

Zambezia

<1.0
1.0–2.0
2.0–3.0
3.0–4.0
>4.0
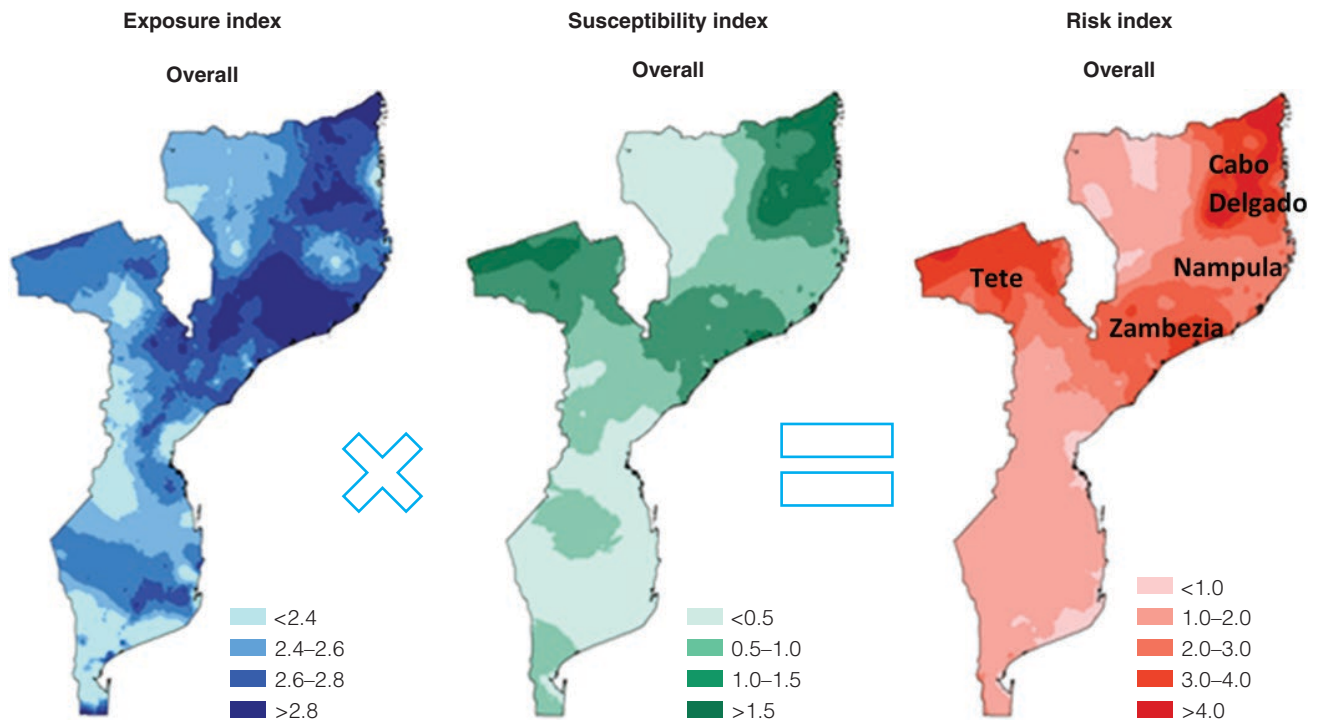
Source: World Bank 2017a.

Map 3.2: Total Enteric Burden DALY Rate for Overall, B40, and T60 Populations, by Region, Nigeria, 2013

Overall

North West

North East

North Central

South West

South South

South East

B40

North West

North East

North Central

South West

South South

South East

T60

North West

North East

North Central

South West

South South

South East

DALYs/100,000 children

<8,000
8,000–12,000
12,000–16,000
16,000–20,000
20,000–24,000

Kilometers

0   250   500
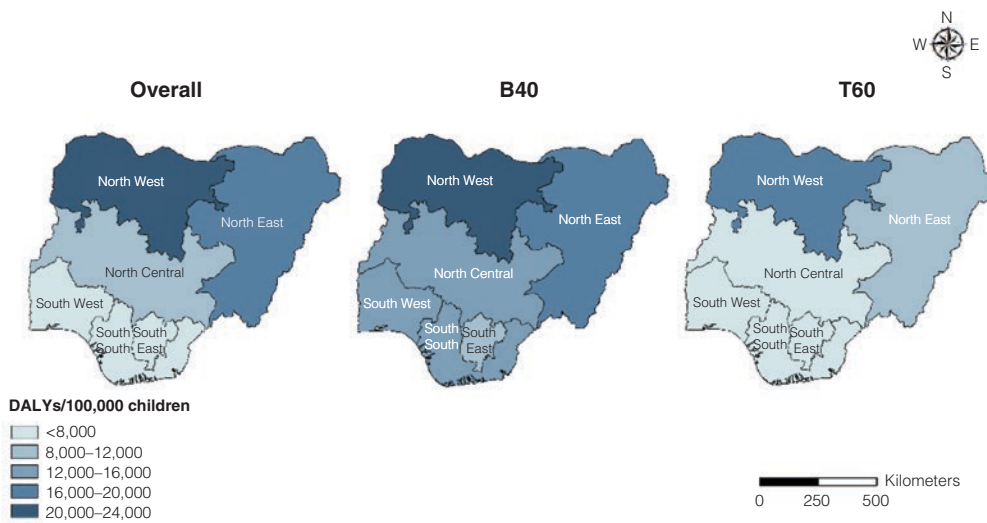
Source: World Bank 2017b.
Note: B40 = bottom 40 percent of asset wealth distribution; T60 = top 60 percent of asset wealth distribution.

Map 3.3: Effects of Improvements in Water and Sanitation on Reducing Diarrheal Disease Risk in Pakistan

a. Shift from unimproved to improved water off premises

b. Shift from unimproved to improved sanitation
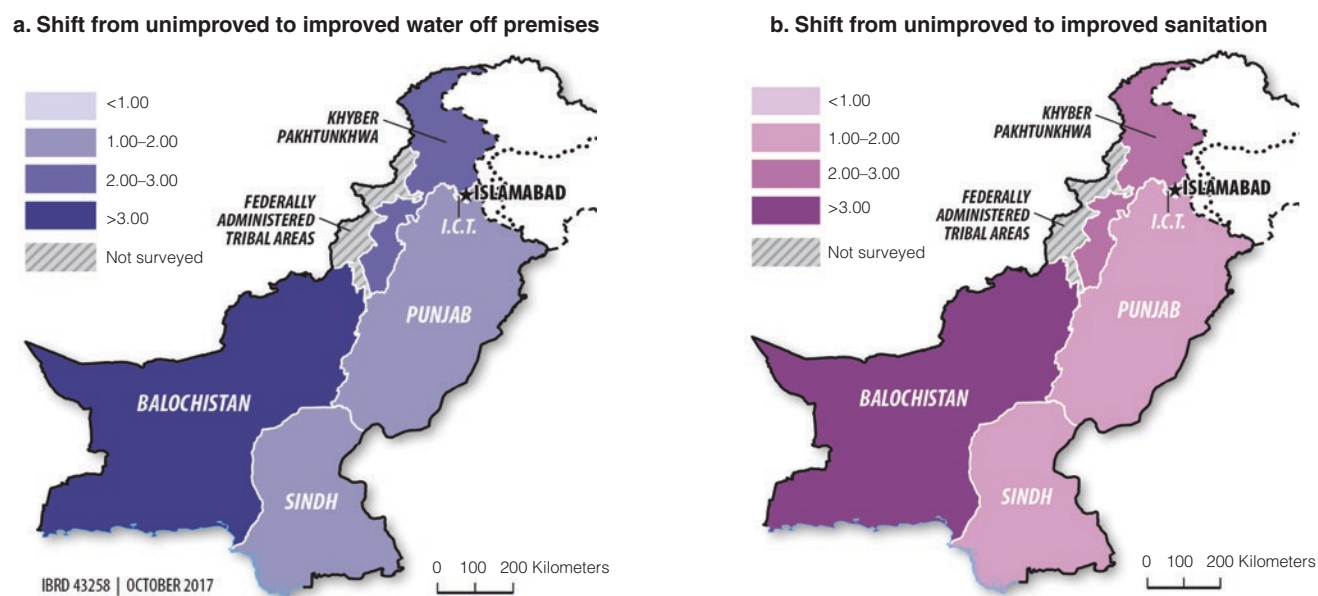
Source: World Bank, forthcoming.

The burden of children in the northwest is the greatest overall (23,489 DALYs per 100,000 children). Based on these estimates, the national diarrheal burden associated with inadequate WASH services is 10,083 DALYs per 100,000 children per year. This is approximately 73 percent of that estimated by the Global Burden of Disease project for the country.[14]

These insights provide a compass for where WASH dollars might have the greatest impact in reducing the risks of under-5 child mortality from diarrhea and provide a platform for cross-sector collaboration. The model also enables one to simulate the potential effects on disease risk of improvements in water access. Map 3.3a analyses improvements at the province level in *Pakistan*. Map 3.3a presents a distribution of the risk index across provinces as it would be if every household with unimproved water were given access to an improved water source (off household premises). Map 3.3b presents the distribution of the risk index across provinces if every household with unimproved sanitation were given access to improved sanitation (nonsewerage). According to the maps, children from Balochistan would experience the greatest risk reduction in response to these improvements, but all provinces would benefit.

Conclusions and Policy Considerations

This chapter considered the health of children under 5, as indicated by the incidence of diarrheal disease and chronic undernutrition (measured by height- and weight-for-age), as an additional—and critical—factor to consider when allocating resources for WASH services. While young children's health interrelates with monetary measures of poverty and other factors associated with unequal access to WASH services (analyzed in chapter 2), focusing on it specifically (and independently of efforts to reduce poverty) offers a good opportunity to support long-term health outcomes with relatively little effort.

To effectively include children's health indicators in decisions on where to allocate investment, it is also necessary to understand how inequalities in access to WASH services,

health services, and food interact. These inequalities—and their interactions—vary across geographic areas and among socioeconomic groups. Various tools of analysis, as outlined here, can help identify high-risk pockets. In the context of limited budgets, this knowledge is essential to the design and targeting of interventions designed to expand access to WASH services.

The large gaps in access to WASH services documented in chapter 2 are accompanied by considerable gaps in access to the main drivers of children's nutrition—food security, WASH services, personal care and feeding practices, and health care. Access to one or more of these drivers can strengthen the impacts of WASH investments on children's health. A lack of access, conversely, can undermine them. The findings presented here suggest that progress toward reducing stunting, a key measure of child nutrition and long-term health, can be enhanced by well-designed, well-implemented, and well-coordinated multisectoral interventions that effectively address the main drivers of nutrition, especially among the poorest segments of the population in each country. In particular, simultaneous improvements in access to adequate WASH services and adequate health care were shown to produce benefits that are greater than the sum of their parts.

The analysis reveals that across all regions and countries studied (that is, 7 of the 18 countries covered by the Initiative), the greatest burden of disease associated with unimproved water and sanitation is borne by the poorest—across national, urban and rural, and subnational populations. Specifically, the risk of death is 2.6 times greater in the poorest quintile (equity ratio) than in the richest in the *Democratic Republic of Congo*, *Haiti*, and *Tajikistan*, with the disparity rising to 3.9 times in *Nigeria*. This is consistent with patterns of access to water and sanitation and health-care services (oral rehydration therapy and vitamin A), and the prevalence of undernutrition (again, as measured by height- and weight-for-age).

Rural populations across all countries analyzed had a greater absolute and population-adjusted burden of WASH-related disease. However, the degree of disparity between the poor and non-poor was much greater among urban than rural households. Notably, in *Ethiopia*, *Mozambique*, and *Haiti*, the ratio of access to improved sanitation between the poor and non-poor is two to four times greater among urban children than rural children.

In sum, a number of priorities for designing more effective WASH investment strategies are revealed by this analysis:

- For new WASH investments to have the maximum impact on reducing diarrheal disease among children under 5, they must not be based simply on the poor conditions of WASH services in a given area. Instead, they must target geographic areas where children have both poor WASH access *and* high vulnerability to diarrheal mortality, as determined by their access to key health services and nutrients. This may also facilitate cross-sectoral planning, delivery, and monitoring.

- Strategies to target investments toward groups with the greatest risk will require not only the identification and location of these groups, but also that the WASH services provided or promoted are appropriate, available, and accessible to these groups.

- The analysis describes how WASH-related risk is distributed across wealth levels, between rural and urban populations, and by geographic location. A simple next step would be to map existing water and health programs against these findings, in order to assess the extent to which investments are reaching the children who can gain the most from them.

In combination, these insights into the complex interactions of WASH services with other sectors provide a useful compass for where WASH investments can have the biggest impact on children's health outcomes, and provide a useful platform for cross-sectoral efforts to speed progress toward the SDGs.

Notes

1. See Chase and Ngure (2016) for a detailed discussion of the pathways through which inadequate WASH affects children's nutrition levels.
2. Such as rotavirus, Shigella spp., pathogenic Escherichia coli (*E. coli*), Giardia spp., and Cryptosporidium spp., to name a few.
3. Institute for Health Metrics and Evaluation: http://www.healthdata.org/.
4. Chagas, dengue, dracunculiasis, echinococcosis, foodborne trematodiases, human African trypanosomiasis, onchocerciasis, rabies, schistosomiasis, soil-transmitted helminthiases, cysticercosis, trachoma, and yaws are considered to be WASH-related NTDs.
5. This 2014 figure is agreed on by the UNICEF, the WHO, and the World Bank. Statistically speaking, a child is stunted if his/her height-for-age z-score (HAZ) is less than 2 standard deviations from the median height of a healthy reference population.
6. The Thousand Days Index (TDI), for example, is a multisectoral tool consisting of 28 different indicators classified under the 4 drivers of nutrition. For example, see Lavendez (2015).
7. The WASH-PRM includes some characteristics of the WHO's Global Burden of Disease approach and some of the Lives Saved Tool (LiST), both of which are extensively used in the health sector. The key distinction between these two approaches is that the WASH-PRM's objective is to estimate the combined effect of the codistribution of risk factors on disease across subpopulations. With respect to LiST, the key difference is that the WASH-PRM model uses actual data on the correlation or codistribution of exposure and susceptibility risk factors within economic and geographic subpopulations, thus accounting for any layering of inequalities. For more details, see Rheingans et al. (2017).
8. A more detailed discussion of the methodology used and the specific variables used for the components of care, health, environment, and food security is contained in a background synthesis paper by Skoufias and Vinha (2017), based on the WASH Poverty Diagnostics. Having an "adequate" level of WASH or environment, for example, is defined as follows. A household has adequate WASH, if: (i) it has improved water facilities, (ii) it has improved sanitation (based on the WHO/UNICEF Joint Monitoring Program [JMP]), and (iii) at least 75 percent of the households in the community have improved sanitation. In the countries where this information is available, access to adequate WASH also includes: (iv) adequate handwashing facilities along with water and soap or detergent, as observed by the interviewer; and (v) the children's stools are disposed of into an improved sanitation facility.
9. A child is defined as having adequate access to the drivers of nutrition (care, health, WASH, and food) if the child has adequate access to any two, any three, or all four of the drivers of nutrition at the same time. Although this is admittedly a very strict criterion, it is in line with the UNICEF conceptual framework that assumes that increases in access to adequate levels in one of the four determinants alone cannot substitute for inadequacies in the other three underlying determinants.
10. Care must be taken when comparing across countries as the definitions for adequate access differ based on data availability and context. As such, access not deemed not adequate in one setting may well have been characterized as adequate in another.
11. The differences in the point estimates of stunting are statistically significant (see table 4 in Skoufias and Vinha [2017]).
12. The same general relationship holds in both urban and rural areas as well as for children in the B40 and T60 of the distribution of wealth in each country (Skoufias and Vinha 2017).
13. In fact, it was also confirmed that the "synergy effect" on stunting between WASH and health is statistically significant. Statistically significant synergy effects were also detected for mean HAZ scores as well as separately for rural and urban areas in the pooled sample. The "synergy" effect was not statistically significant when cluster-level fixed effects are used in place of country-level fixed effects (see Skoufias and Vinha 2017).
14. It is worth noting that the Global Burden of Disease project provides its own estimate of the burden attributable to inadequate WASH. However, this estimate differs from that of the WASH-PRM in several important ways. First, the WASH-PRM accounts for

the codistribution of inadequate WASH and child susceptibility. Second, by using underlying data on the distribution of risk factors, the WASH-PRM examines the distribution across economic and geographic subpopulations. Last, both estimates use slightly different assumptions regarding the relative risk associated with different WASH service levels.

References

Black, R. E., C. G. Victora, S. P. Walker, Z. A. Bhutta, P. Christian, M. de Onis, M. Ezzati, S. Grantham-McGregor, J. Katz, R. Martorell, R. Uauy, and the Maternal and Child Nutrition Study Group. 2013. "Maternal and Child Undernutrition and Overweight in Low-Income and Middle-Income Countries." *The Lancet* 382 (9890): 427–51. http://dx.doi.org/10.1016/S0140-6736(13)60937-X.

Chase, C., and F. Ngure. 2016. "Multisectoral Approaches to Improving Nutrition: Water, Sanitation and Hygiene." Water and Sanitation Program, World Bank Group, Washington, DC.

Cumming, O., R. Rheingans, J. Anderson, K. Bagamian, L. Andres, C. Kullman, E. Skoufias, and S. Ryan. Forthcoming. *Estimating the Distribution of the Water and Sanitation Attributable Enteric Disease Burden in Seven Low Income High Burden Countries—The Application and Validation of a Novel Quantitative Risk Assessment Model*.

Galasso, E., and A. Wagstaff, with S. Naudeau, and M. Shekar. 2017. "The Economic Costs of Stunting and How to Reduce Them." World Bank Policy Research Note, PRN/17/05, March 2017, World Bank Group, Washington, DC.

IHME (Institute for Health Metrics and Evaluation). 2015. http://www.healthdata.org/.

Lavendez, F. 2015. *Peru: One Thousand Days Index Explicit Guarantees for Human Development in the First 1,000 Days of Life*. Washington, DC: World Bank.

Skoufias, E., and K. Vinha. 2017. "WASH as Part of a Multi-Sectoral Effort to Reducing Undernutrition: A Synthesis of the Findings in WASH Poverty Diagnostic." Working Paper.

UNICEF (United Nations Children's Fund). 1990. *Strategy for Improved Nutrition of Children and Women in Developing Countries*. A UNICEF Policy Review. New York: UNICEF.

Victora, C. G., M. de Onis, P. C. Hallal, M. Blössner, and R. Shrimpton. 2010. "Worldwide Timing of Growth Faltering: Revisiting Implications for Interventions." *Pediatrics* 125 (3): e473–80.

WHO (World Health Organization). 2014. *Preventing Diarrhoea through Better Water, Sanitation, and Hygiene- Exposures and Impacts in Low- and Middle-Income Countries*. Geneva: World Health Organization.

———. "Health in the Post-2015 Development Agenda: Need for a Social Determinants of Health Approach." Joint Statement of the UN Platform on Social Determinants of Health. http://www.who.int/social_determinants/advocacy/health-post-2015_sdh/en/.

World Bank. 2013. *Improving Nutrition Through Multi-Sectoral Approaches*. Washington, DC: World Bank.

———. 2017a. *Findings of the Mozambique Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. World Bank, Washington, DC.

———. 2017b. *A Wake Up Call: Nigeria Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. World Bank, Washington, DC.

———. Forthcoming. *Stunting and Poverty: What's WASH Got to Do with It? Pakistan Water Supply, Sanitation, and Hygiene Poverty Diagnostic.* WASH Poverty Diagnostic. World Bank, Washington, DC.

Chapter 4
Follow the Money: More and Better-Targeted Investments to Reflect Policy

This chapter documents how the inequalities reviewed in chapter 2 result in part from a skewed allocation of resources, often in spite of policy commitments to benefit the poor. The analysis reveals that to achieve the Sustainable Development Goals (SDGs), countries need to nearly quadruple their current capital spending on water supply, sanitation, and hygiene (WASH). While current WASH funding comes from a combination of household, private sector, donor, and public sources, ensuring sustainable and equitable services will hinge on substantial public investment.

Given budget constraints, such public investment will need to be carefully targeted and efficiently allocated if, indeed, services to the poor are a priority. This "if" is important. Even where policies state an intention to target the poor, relevant allocation criteria are frequently not adhered to in practice. Instead, allocations frequently favor urban over rural areas, large cities over small towns, and urban centers over peripheral neighborhoods. Water is prioritized over sanitation, and given that sanitation is often viewed as a private good by governments, this priority disproportionately affects the poor, who typically cannot afford such services on their own. If equity is the guiding criteria for resource allocation decisions, then greater investment should be directed toward rural areas and toward sanitation.[1]

This chapter documents the gap between what public policies aspire to achieve and what governments in fact prioritize based on how and where they allocate resources. The WASH Poverty Diagnostic Initiative did not explore the upstream political economy—what the 2017 *World Development Report* (World Bank 2017) terms the "policy arena"—that contributes to this disconnect, but rather calls attention to the ways in which the policy arena obstructs attainment of the WASH-related SDGs. Chapter 5 continues the examination begun here of gaps between commitments on paper and government actions in practice, while shifting the focus from resource allocation to efficiency in order to understand the institutional constraints on downstream service outcomes once resources are allocated. Together, the skewed allocation of resources and inefficiencies in how they are used frequently result in service delivery failures, thereby perpetuating inequalities that are passed down through generations.

Funding Needs and Composition

Public capital expenditure on WASH is between 0.20 and 0.40 percent of gross domestic product (GDP), on average. Countries in Latin America and the Caribbean invest roughly 0.25 percent of GDP, and have achieved better access in water but less so in sanitation (Fay et al. 2017). In Sub-Saharan Africa, public sector and donor investment in WASH accounts for about 0.40 percent of GDP (authors' own calculations based on Foster and Briceño-Garmendia [2009]). Similarly, South Asian countries invest between 0.40 and 0.50 percent of their GDP on capital investments in WASH (Biller, Andres, and Herrera Dappe 2014). These regional tendencies are reflected at the country level by the analysis carried out for the WASH Poverty Diagnostics. In *Nigeria*, the government spent close to 0.32 percent of GDP in annual

capital investment in the water sector between 2006 and 2010. *Tunisia* spent 0.42 percent of GDP on WASH in 2015. Annual investments in water and sanitation in *Guatemala* averaged close to 0.34 percent of GDP between 2010 and 2015.

Often, budget allocations are not only insufficient, but have consistently fallen short of delivering on policy promises, resulting in a significant financing gap. *Niger* provides an example of this. Since 2005, investment in the WASH sector has represented on average 1 percent of the voted budget. While investment in WASH from 2005 to 2015 totaled $136.1 million, the projected funding requirements for 2016–30 are close to $3 billion in rural areas alone (World Bank 2016).

Current funding levels are sufficient to achieve universal access to basic WASH services by 2030; however, achieving the SDGs will cost four times as much. A recent World Bank study (Hutton and Varughese 2016) estimated that extending basic WASH services to the unserved in a set of 140 mostly developing countries would cost $28 billion a year from 2015 to 2030, or 0.10 percent of these countries' GDP, on average.[2] By contrast, the capital funding required to achieve universal basic coverage in the areas covered by the Initiative is estimated to be about 0.88 percent of GDP, on average. To achieve the more ambitious SDG targets in these 18 countries, this share would need to rise to a daunting 3.1 percent of GDP (table 4.1).

Table 4.1: Investment Needed to Achieve Basic, Universal Coverage vs. Specific SDG Targets

	Total Costs		Proportion of GDP	
	Universal	Targets 6.1 +	Universal	Targets
	Basic (USD	6.2	Basic (%)	6.1+6.2
Bangladesh	$ 448	$ 3,170	0.31%	2.17%
Congo, Dem. Rep.	$ 925	$ 2,274	2.57%	6.31%
Ecuador	$ 81	$ 454	0.08%	0.47%
Ethiopia	$ 2,516	$ 5,167	4.41%	9.06%
Guatemala	$ 76	$ 590	0.13%	1.02%
Haiti	$ 33	$ 268	0.36%	2.91%
India	$ 4,845	$ 20,171	0.23%	0.98%
Indonesia	$ 1,841	$ 5,186	0.19%	0.53%
Mozambique	$ 221	$ 1,054	1.26%	6.00%
Niger	$ 190	$ 762	2.39%	9.60%
Nigeria	$ 3,618	$ 10,021	0.62%	1.73%
Pakistan	$ 636	$ 4,331	0.24%	1.63%
Panama	$ 53	$ 151	0.11%	0.30%
Tajikistan	$ 15	$ 122	0.15%	1.24%
Tanzania	$ 596	$ 2,763	1.52%	7.06%
Tunisia	$ 44	$ 243	0.09%	0.48%
Yemen	$ 114	$ 474	0.29%	1.22%
WPD(17)	$ 16,250	$ 57,202	0.36%	1.27%
WPD(17) (simple Avg)	**$ 956**	**$ 3,365**	**0.88%**	**3.10%**
Global (140 countries)	$ 34,835	$ 150,990	0.12%	0.51%

Source: Author's elaboration based on Hutton and Varughese (2016).
Note: GDP = gross domestic product; WPD = WASH Poverty Diagnostic.

Box 4.1: World Bank Support for the Water Sector

The World Bank's Water Global Practice is currently managing a lending portfolio that includes 177 projects totaling $24.5 billion, accounting for about 11 percent of total World Bank lending. In addition, projects with a water-sector-related component managed by other global practices total $10 billion. Water supply, sanitation, and hygiene (WASH), currently account for about 60 percent of the total water portfolio, with about one-third devoted to urban water supply and one-quarter to rural water supply. A major change in the past year has been the significant growth of the portfolio's sanitation component under the influence of the long-term Water and Sanitation Program (WSP), which is particularly active in rural areas.

According to the World Bank's Independent Evaluation Group (2017), among the WASH projects approved during fiscal years (FY) 2007–16, 87 percent focused on urban areas and 74 percent on rural areas (including projects that covered both). Of World Bank commitments to water and sanitation during FY 2007–16, 35 percent went to water supply and 37 percent to sanitation (including wastewater management). These were followed by a general category that includes flood protection and development policy lending (28 percent).

Source: Global Water Security and Sanitation Partnership (GWSP) and IEG 2017.

WASH funding comes from a variety of sources, including public expenditure, household consumption, private sector investment, and donor contributions. However, most capital-specific investments are likely to originate from the public sector, so public resources need to be better targeted. In the long term, mobilizing private sector finance will improve the sector's sustainability. The World Bank's support for the water sector is detailed in box 4.1.

Households fund the bulk of WASH services, predominantly through tariffs, and self-supply solutions such as wells, water tanks, and septic tanks. According to the Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS), an annual analysis conducted by the World Health Organization (WHO) and the United Nations (UN), households contribute the most to the sector. In a sample of 25 countries, an estimated 66 percent of funding for WASH originated from household sources (see figure 4.1), representing $43 billion in annual WASH expenditure (GLAAS 2017). These findings are consistent with the WASH Poverty Diagnostics. In *Tunisia*, the bulk of WASH expenditure comes from households, including via tariffs and investments in self-supply. On average, household finance accounted for 75 percent of total expenditure on water and 57 percent of total expenditure on sanitation. Similarly, households in *Bangladesh* contribute 54 percent of the nation's total expenditure on WASH. However, households in *Tajikistan* and *Pakistan* contribute only 16 and 23 percent, respectively.

Foreign aid also plays an important role. Globally, over $11 billion in grants, loans, and funds from high-income countries and other entities were spent on water and sanitation in 2015 (GLAAS 2017). While external aid flows compose a small proportion of global expenditures on WASH, in some countries, the aid received from external sources is substantial and can represent the largest source of nonhousehold WASH funding. According to GLAAS (2017), more than 20 percent of WASH funding came from external sources in almost half of those countries surveyed that reported all their sources of WASH financing.[3] In *Haiti*, the donor community finances all water and sanitation investments and 30 percent of the sector's

Figure 4.1: Sources of Financing for WASH (25 Countries)
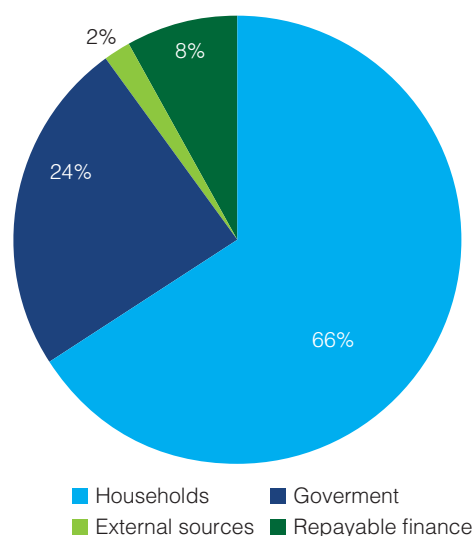
Source: GLAAS 2017.

operating expenditures. In the **Democratic Republic of Congo**, approximately 90 percent of sector investments over the past few years have been externally funded, while in the **West Bank and Gaza**, donors finance 76 percent of capital investment, most of which is off-budget and may be arranged outside the formal planning process. Thus, there is scope for the better targeting of donor investments as well.

Formal private sector participation in WASH is limited, and most is in the form of public-private partnerships. Informal service providers play a significant role in several countries. For instance, in Bauchi, **Nigeria**, private vendors contract with the Bauchi State Water and Sewerage Corporation (BSWSC) and connect to its pipe network. In certain areas, cart vendors source their water from the BSWSC's burst pipes, or from public standpipes or boreholes. Water delivered by tanker truck is usually purchased directly from sales points maintained by the BSWSC. In **Haiti**, the informal private sector has taken advantage of a lack of government capacity amid increased demand for improved water services triggered by a cholera outbreak. The percentage of Haitians who resorted to informal providers to satisfy their drinking water needs increased from 11 to 26 percent between 2006 and 2012.[4] In urban areas, this figure was even higher: 57 percent in the Port-au-Prince Metropolitan Area and 45 percent in the country's other cities.

Policy: Actual Allocations Diverge from Written Commitments

On paper, policies and voted budgets often look "good" in terms of their commitments to extend WASH services to poor and marginalized populations. While there are no standard objective criteria for judging whether policies are "good" or "bad," they can be assessed from the perspective of providing affordable, sustainable, and equitable services to poor and marginalized groups and indigenous communities. While it is infrequent that formal policy declarations are overtly "bad" by this metric, in some cases they do not explicitly recognize or target certain groups or services. The policy in **Niger** (PROHESA 2016-30) clearly articulates the state's commitment to ensuring equal access to WASH services, and their affordability, and would, by

this yardstick, be considered "good." Likewise, a guiding principle of **Mozambique's** National Water Policy (PNA) is to increase water coverage for the poorest and most vulnerable. In **Tanzania**, however, except for a funding formula intended to benefit the unserved, the policies and laws governing rural water provision do not include explicit measures for targeting the poor. **Guatemala** also lacks a policy commitment that explicitly addresses poor populations.

The evidence suggests that while countries often commit themselves, *de jure*, to allocating resources to benefit the poor, actual allocations often diverge from these commitments. This chapter focuses on one key manifestation of *de facto* policy: namely, budget allocations. The differences between policy statements and actions in a set of 11 countries are presented in table 4.2, adapted from a GLAAS analysis of whether these (mostly developing) countries have enabling environments for achieving the SDGs (GLAAS 2017). The table presents the countries' self-assessment of policies aimed at achieving equitable provision of water and sanitation. The *de jure* columns reflect policy intentions and the *de facto* columns reflect actions taken.

An in-depth exploration of the upstream political economy dynamics that play out in the policy arena, resulting in a gap between policy and resource allocation, was beyond the scope of the WASH Poverty Diagnostic Initiative. Political economy analysis can be applied at two different levels (i) the upstream ("policy arena") level, where policies are debated, designed, and enacted; and (ii) the downstream level, where policies are implemented by service providers. Insofar as resource allocation is an expression of policy, it is at the first of these two levels. The Initiative took resource allocation as an outcome, but did not probe the upstream "policy arena" to understand its reasons. Chapter 5 proceeds to the second level, to analyze the downstream dynamics that result in the inefficient use of resources once they are allocated.

Skewed Resource Allocations

Despite "good" policies and budgets, there are structural inequalities in how resources are allocated. For example, in most of the countries studied as part of the Initiative, budget allocations clearly favor urban areas over rural ones, water services over sanitation, and the creation of new assets over the maintenance of existing ones. As noted earlier, investing in urban areas would be a very sensible pro-poor strategy in certain circumstances. However, if policy makers and donors have equity as a goal for WASH spending, current investments are systematically missing that goal. In **Niger,** the rate of access to improved water in urban areas stands at 100 percent. Yet in rural parts of the same country only 1 percent of the people have access to improved sanitation. While those living in cities saw their access to improved water increase by 39 percentage points between 1990 and 2015, open defecation increased in poor rural areas. These statistics are difficult to ignore given that 81 percent of the country's total population live in rural areas, as do 90 percent of the poor, who are largely concentrated along the country's southern border.

Both public sector and donor spending on WASH favor water over sanitation. In a GLAAS survey sample of 24 countries (GLAAS 2017), 43 percent of nonhousehold WASH expenditure went toward improving sanitation while 56 percent went toward water (figure 4.2 panel a). The WASH Poverty Diagnostic Initiative found a similar pattern. For example, in the **Democratic Republic of Congo**, the limited finance available to the sector is focused on just two institutional channels: the urban-focused national water utility (Régie de distribution d'eau, REGIDESO) and the "Healthy Schools and Villages" program led by the United Nations Children's Fund (UNICEF) and the Ministry of Public Health. Both have absorbed the vast majority of WASH funds over the past decade, meaning that urban areas and drinking water services receive a disproportionate amount of total funding. A similar trend can be seen in **Nigeria**, where 96 percent of expenditure on WASH went to drinking water services, and only 4 percent was devoted to sanitation services.

Spending on urban areas also tends to exceed spending on rural areas. A GLAAS survey of 13 countries found that nonhousehold expenditures on WASH services were more than three

Table 4.2: Gaps between Policy Statements and Actions in Selected Countries

	EQUITY											
	Policies and plans have specific measures (*de jure*) for:				Specific measures in the financing plan to target resources to vulnerable populations (*de facto*)							
	National				Sanitation				Drinking Water			
Country	Poor populations	Women	Populations living in slums or informal settlements	Indigenous populations	Poor populations	Women	Populations living in slums or informal	Indigenous populations	Poor populations	Women	Populations living in slums or informal	Indigenous populations
Bangladesh	Yes	Yes	Yes	Yes	Yes	Yes (-)	Yes (-)	Yes	Yes	Yes	Yes (-)	Yes
Congo, Dem. Rep.	Yes	Yes	Yes		No	No	No	No	No	No	No	No
Ethiopia	Yes	Yes	Yes	Yes	No	No	Yes (-)	No	No	No	Yes (-)	No
Guatemala	No	No	No	No								
Haiti	No	No	Yes	No	No	No	No	No	No	No	No	No
India	Yes	Yes	Yes	Yes	Yes	Yes	Yes (-)	Yes	Yes (-)	No	Yes (-)	Yes
Mozambique	Yes	Yes	Yes		No	No	No		No	No	No	
Nigeria	Yes	Yes	Yes	Yes	No	Yes (-)	Yes (-)	No	No	Yes(-)	Yes (-)	No
Pakistan	Yes	No	Yes	Yes	Yes (-)	No	Yes (-)	Yes (-)	Yes (-)	No	Yes (-)	Yes (-)
Panama	Yes	Yes	Yes	Yes	No	No	Yes (-)	Yes (-)	No	No	Yes (-)	Yes (-)
Tajikistan	No	No	No	No	No	No	No	No	No	No	No	No

Yes = Yes and measures applied

Yes (-) = Yes but measures not applied consistently

No = No

Source: GLAAS 2017.

Figure 4.2: Public and Private Spending on WASH, by Focus and Area

a. Non-household WASH expenditure (n = 24)

US$ 13 billion

■ Water ■ Sanitation ■ Hygiene

b. Non-household WASH expenditure (n = 13)

US$ 3.7 billion
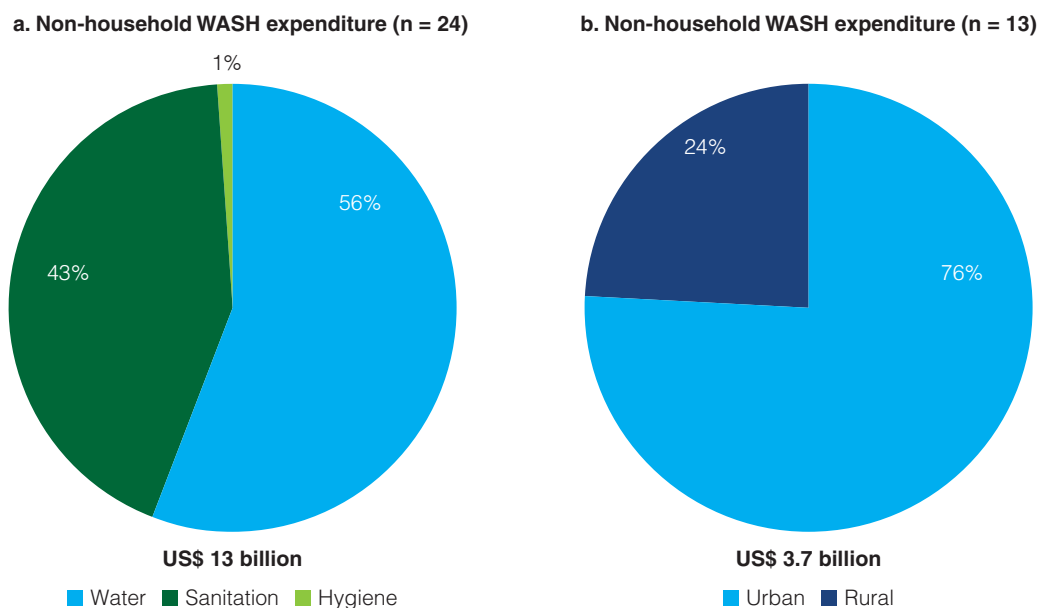
■ Urban ■ Rural

Source: GLAAS 2017.
Note: Data from India have been excluded from the chart in panel a. WASH = water supply, sanitation, and hygiene.

times higher in urban areas than in rural areas (figure 4.2 panel b). Evidence from the Initiative supports this finding. In *Niger*, a large influx of resources for urban water projects, notably through the International Development Association of the World Bank, has tipped financing toward that subsector. This parallels the skewing of public expenditures toward the more affluent population in the capital city, Niamey, and toward construction of large assets over maintenance of existing assets. In the *Democratic Republic of Congo*, REGIDESO has worked to strengthen its financial position through a focus on its traditionally strongest service areas in Kinshasa, Lubumbashi, and Matadi, and, within these cities, on relatively rich and centrally located neighborhoods. In *Nigeria*, *Tunisia*, and *Bangladesh* at least two-thirds of total WASH spending was allocated to urban areas. *Mozambique* also illustrates the skewing of resources toward urban WASH, despite policy commitments to the contrary. While sector policy states that budget allocations and fiscal transfers should be based on poverty and basic needs, the policy is not borne out in practice, resulting in significant geographic disparities. Over the past 10 years, a disproportionate share of sector investments has been focused on wealthy urban neighborhoods. The World Bank (2010) reports that prior to 2006 almost all donor-financed water projects in the country were in urban areas. In 2007 per capita spending on urban water exceeded that on rural water by almost 12 times. In *Tanzania*, rural water supply has been relatively underresourced compared with urban WASH services, even though most Tanzanians reside in rural areas.

Expenditures on WASH appear to be regressive. In *Pakistan*, the lion's share of overall resources go to provincial capitals that are among the richest districts in the nation. Even when national capitals are excluded from the analysis, there is no relationship between district-level poverty levels and resource allocation. This pattern holds for WASH-specific investments as well. Districts where a relatively large share of households have access to improved water and sanitation benefit from a higher rate of WASH expenditure per capita than districts where access rates are low.

A potential driver of the divergence between policy commitments and actual resource allocations is elite capture, defined by the 2017 *World Development Report,* as "the ability of influential groups to *capture* policies and make them serve their narrow interests" (World Bank 2017). The widespread underfinancing of rural WASH (and rural sanitation in particular) may be seen as a form of capture, whereby the interests of urban elites are more effectively represented than those of the rural majority, who are likely to have less political power and influence. Compared with other services, rural sanitation is very likely to be low on the political agenda. The health risks of inadequate sanitation (such as open drains and fecal waste in public areas) may not be well understood by citizens, and the wealthiest population groups may be insulated from visible service failures such as flooded pit latrines (Mason, Batley, and Harris 2013). Higher-income households may not demand improved state provision of sanitation if they can opt for private provision (McGranahan 2015). These dynamics and their implications will be explored further in chapter 5.

Limited Planning and Prioritization

In a context of high population growth, the funding gap further emphasizes the need for an informed prioritization of investments. Policy makers are often confronted with a myriad of factors to consider in the investment decision-making process. The problem of conflicting priorities is particularly acute in infrastructure decisions, which often involve large investments and lock-in technologies. In regions and countries where the infrastructure access gap is large and public budgets severely constrained, the importance of considering the different facets of the decision-making process become even more relevant (Andres, Biller, and Herrera Dappe 2015).

A significant weakness in planning and budgeting has been that responsibility for project delivery is often split across agencies and there is no mechanism for coordination. For instance, in *Yemen*, three agencies share the responsibility for planning and budgeting for WASH, without any mechanism for joint planning at the local level or for consolidation, the elimination of overlap, or the exploitation of synergies either at central or local levels. These coordination problems have been exacerbated by the current armed conflict. In the *West Bank and Gaza*, there is no clear mechanism by which investment priorities at the local level can be addressed. Local government units lack a stable and predictable source of investment finance for strategically planning their water operations. Consequently, plans developed at either the local or national level are overambitious and/or unrealistic. In *Nigeria*, responsibility for the water sector is shared across 36 states, making it difficult to implement national programs—though, in practice, the federal government plays a substantial role in financing capital investments. Coordination of planning and budgeting of investments and of associated operations and maintenance is challenging given the number of actors, as well as their diverse incentives and priorities for allocating resources to the sector. Institutional arrangements have profound implications for the delivery of WASH services, as will be explored further in chapter 5.

Conclusion

Disparities in the WASH sector are largely explained by a skewing of resources toward urban water over other services. A preference for allocating funds to urban water is particularly evident in Sub-Saharan Africa, where access to piped water is between 80–100 percent in Maputo, Addis Abba, Kinshasa, and Niamey, but only 27–33 percent in the rural areas outside the four capital cities, despite the fact that the latter are home to only about 8 percent of the total population and a small fraction of the poor in their respective countries. If policy makers aim to achieve equity of access to WASH services, resources will need to be redirected to reach the poor and unserved in rural areas, small towns, and peri-urban areas.

If the world hopes to meet the SDGs, it is essential to close the huge WASH infrastructure gap. Current levels of sector funding can cover the capital costs of achieving universal basic services for WASH by 2030, provided resources are targeted to the areas of greatest need. However, as has been noted, the capital investments required to go beyond basic services to achieve the SDG targets for WASH are estimated to be about four times current levels.

Most countries have limited fiscal space to increase public investments; in some, achieving the SDGs for WASH will require a significant reprioritization of investments. Given the capital costs of reaching the SDGs, investments will have to be much more efficient. In practice, this means that urban water service providers will have to become more efficient. It also means that governments will have to allow water providers access to private capital so as to widen the fiscal space sufficiently to permit public investments in expanding access in areas where people's ability or willingness to pay for services may be low (for example, for urban sanitation, rural sanitation, and rural water), and to support operations and maintenance as required. To repeat an important point made in this chapter: policy makers are typically confronted with many factors in the investment decision-making process. In regions and countries where the infrastructure access gap is wide and public budgets severely constrained, the importance of considering the different facets of the decision-making process become even more relevant.

Aligning actions with policy statements is key. This chapter identified significant gaps between policy intentions and actions, as expressed through budget allocations. Careful planning and implementation are key to achieving the universal aspirations expressed in the SDGs, with special attention to the most vulnerable populations. However, as will be shown in chapter 5, the distribution of power and institutional weaknesses are often the drivers of skewed allocations and inefficiencies in financing, despite policies that look good on paper.

Notes

1. Following from the SDGs and the World Bank's twin goals, this report uses equity as the guiding criterion while recognizing that investing in urban areas could be a very sensible pro-poor strategy if funding is constrained and there is a greater density of poverty in cities, and/or there are economies of scale in city investment, and/or a city's (marginal) productivity is higher and so drives growth in the economy.
2. The unit costs on which these estimates are based implicitly include the prevailing inefficiencies in the system. Costs could be lower to the extent that these inefficiencies are reduced.
3. GLAAS has data from 25 countries that reported all their sources of financing,
4. Enquête Mortalité, Morbidité et Utilisation des Services (EMMUS), various years.

References

Andres, L., D. Biller, and M. Herrera Dappe. 2015. "A Methodological Framework for Prioritising Infrastructure Investment." *Journal of Infrastructure Development* 8 (2): 1–17.

Biller, D., L. Andres, and M. Herrera Dappe. 2014. "Infrastructure Gap in South Asia: Infrastructure Needs, Prioritization, and Financing." Policy Research Working Papers Series 7032, World Bank, Washington, DC.

Fay, M., L. Andres, C. Fox, U. Narloch, S. Straub, and M. Slawson. 2017. *Rethinking Infrastructure in Latin America and the Caribbean: Spending Better to Achieve More.* Washington, DC: World Bank.

Foster, V., and C. Briceño-Garmendia. 2009. *Africa's Infrastructure: A Time for Transformation*. Washington, DC: World Bank.

GLAAS (UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water). 2017. *UN Water-GLAAS 2017: Financing Universal Water, Sanitation and Hygiene under the Sustainable Development Goals*. Geneva: United Nations. http://www.unwater.org/publications/un-water -glaas-2017-financing-universal-water-sanitation-hygiene-sustainable-development-goals/.

Hutton, G., and M. Varughese. 2016. "The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene." Technical Paper, Water and Sanitation Program (WSP), World Bank, Washington, DC.

IEG (World Bank's Independent Evaluation Group). 2017. "A Thirst for Change: An IEG Evaluation of the World Bank Group's Support for Water Supply and Sanitation with Focus on the Poor, 2007–2016." IEG, World Bank, Washington, DC.

Mason, N., R. Batley, and D. Harris. 2013. *The Technical is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Drinking Water Services*. United Kingdom: Overseas Development Institute.

McGranahan, Gordon. 2015. "Realizing the Right to Sanitation in Deprived Urban Communities: Meeting the Challenges of Collective Action, Coproduction, Affordability, and Housing Tenure." *World Development* 68: 242–53.

World Bank. 2010. *Mozambique Public Expenditure Review for the Water Sector*. Washington, DC: World Bank.

———. 2016. "BOOST Niger." http://obtables.worldbank.org/boost_niger/.

———. 2017. *World Development Report 2017: Governance and the Law*. Washington, DC: World Bank.

Chapter 5
Mind the Gap: From Policy to Pipes

Solutions need to be tailored to specific, widely varying natural, cultural, economic and political circumstances, in which the art of reform is the art of the possible.
– John Briscoe

In the span of just 12 years (2002–14), the water budget in **Tanzania** quadrupled, owing in large part to enhanced coordination and commitments by donors to achieve the Millennium Development Goal for water. Donor support encouraged the country to adopt reforms aimed at devolving resources and authority to local governments and encouraging community participation in operations and maintenance (O&M)—widely endorsed measures meant to enhance sustainability and promote equity. However, even as of 2015, growth in access to basic water services had stalled at just over 50 percent of the population, and 40 percent of all water points[1] in rural areas were not functional.[2] An estimated 25 percent of all water points in the country break down within two years of construction.

Niger, too, devolved responsibility to the local level for building and managing water supply, sanitation, and hygiene (WASH) services, with the aim of bringing the government closer to the people. But this policy was not accompanied with a commensurate devolution of resources. In practice, the transfer of responsibility for WASH service delivery to poorly resourced communes, with little state capacity to guide and supervise, is tantamount to the state disengaging from the sector. In rural Niger today, the rate of open defecation is 90 percent, among the highest in the world.

Tanzania and Niger are not unique. In most of the World Bank's client countries, the WASH sector is characterized by persistent failures to provide sustainable services to vulnerable populations—even when the funding to do so is available. In addition to the resource allocation issues discussed in chapters 2 and 4, the kinds of service delivery challenges described above point to the critical importance of enhancing the **efficiency of resource use**. In many instances, resources have not been used for the purposes for which they were allocated, often because of a misalignment of incentives. As a result, the WASH sector abounds with examples of poor management of public investment leading to overly expensive designs; infrastructure being built but then poorly maintained; poor budget management leading to delays, cost overruns, and waste; and local governments being allocated responsibilities without the resources or capacity to carry out their designated functions.

Enhancing efficiency is especially important now: the capital investments required to achieve the Sustainable Development Goals (SDGs) for water and sanitation are estimated to be nearly four times current investment levels, as noted several times in this report.

Gaps between Policy and Implementation often Drive Inefficiency

More often than not, failures to provide adequate (WASH) services to the poor and other marginalized groups reflects not bad policy but a failure of policy implementation. As the 2017 *World Development Report* (World Bank 2017a: 2) notes: "policies that should be effective in

generating positive development outcomes are often not adopted, are poorly implemented, or end up backfiring over time." Such failures frequently result from a misalignment of incentives, given the myriad of actors involved in providing water and sanitation services, and their competing interests. While it is now being recognized that political and institutional constraints explain the persistence of gaps between policy and implementation (World Bank 2017a),[3] this understanding has not yet been mainstreamed in operational practice. This chapter represents a step in that direction.

The recognition that the institutional and organizational arrangements that govern the service delivery of WASH affect quality and sustainability is not new to the World Bank's Water Global Practice or to WASH practitioners more generally. Past institutional reform efforts focused mainly on two approaches: insulation/corporatization and decentralization (Herrera and Post 2014). While it has long been recognized that politics matter (Baietti, Kingdom, and van Ginneken 2006; Locussol and van Ginneken 2008) and that efforts to engender increasing autonomy require politicians and civil servants to cede control, this traditional line of thinking stops short of suggesting (possibly second-best) options for situations where the political environment is not conducive to best practice reforms. Furthermore, reform efforts to date have focused primarily on the WASH sector, and have not systematically considered the broader governance landscape in which WASH services are provided. Recent analytical work by Laffont (2005) and Estache and Wren-Lewis (2009) has pointed to the unique challenges that developing countries face in regulating infrastructure, and suggests that rather than prescribing best practices, reformers should instead seek to understand institutional context.

This chapter presents the approach used by the WASH Poverty Diagnostic Initiative to better understand the gaps between policy and implementation, and discusses key findings from the 18 economies in which research was carried out. Among other goals, the Initiative aims to understand the broader governance environment—more specifically, the institutional and organizational arrangements[4] for public management within which WASH services are financed, managed, and delivered, and that affect the quality and sustainability of these services.

Understanding these elements is critical to identify the constraints to improving service outcomes and the scope for feasible reforms to *ensure that increased spending will in fact improve the lives and future opportunities of poor and vulnerable populations*. For practitioners, the message is to do business differently by looking beyond technical solutions and taking a more comprehensive view of WASH service delivery. Understanding the institutional arrangements that drive WASH outcomes is the first step in realigning the incentives of actors toward safely managed services for all.

The Public Sector

To better understand the factors that might impede WASH service delivery, we need to consider the types of functions performed by both central and line/sector agencies. Figure 5.1 provides a stylized depiction of the public sector within which WASH services are delivered. In particular, it shows the links between central and line/sector agencies (World Bank 2012) and between "upstream" and "downstream" functions. While upstream functions are most often centralized (and downstream functions performed at the local level), this is not always the case—a local government can (and often does) perform "upstream" functions. Upstream functions include planning and budgeting, public investment management, financial management, accounting, fiscal reporting, procurement, and intergovernmental systems that impact all services. Downstream functions are those associated with service delivery: the construction of infrastructure, O&M, monitoring, coordination, community engagement, billing, collection, fecal sludge management, and the like.

The traditional approach to analyzing the WASH "sector" typically does not include the impact of cross-cutting (upstream) functions on the delivery of WASH services. In practice, WASH service providers very often operate within the broader public sector. In view of this, shifting the

Figure 5.1: Stylized Public Sector Arrangements for WASH

The public sector

- Upstream institutional arrangements → Formalizing behavior → Upstream functioning of the center of goverment
- Downstream institutional arrangements → Formalizing behavior → Downstream functioning of sector agencies
- Setting environment for downstream functioning
- Sector outputs
- Fiscal and insititutional sustainability
- Objective and subjective devolopment outcomes

Source: Authors elaboration.

focus to the *service* being provided rather than the *sector* itself opens up the ambit of any reform effort. The political environment and the distribution of power within a country impacts both upstream and downstream functions.

Service Characteristics

The distinct characteristics of the different WASH services considered—urban water, rural water, urban sanitation, and rural sanitation—mean that the political and institutional factors affecting the delivery of one may not be relevant for another.[5] Relevant characteristics include the nature of the service being delivered, the type of market failure being addressed, the tasks involved in delivery, and how the service is demanded/consumed. These characteristics have implications for the political salience of the service, and therefore the likelihood that it will be delivered. For example, building new networked water pipes is a highly *visible* activity, resulting in its political salience and prioritization among many governments seeking to claim credit. The O&M of existing infrastructure is less visible, often resulting in its neglect.

However, service characteristics are not immutable. Understanding constraints on the political salience of a particular service is a crucial first step in conceptualizing targeted reforms to

ease those constraints. Appendix D provides additional examples of service characteristics, noting, in particular, their political salience.

Diagnostic Approach: Start with the Problem, not the Solution

As noted earlier, the institutional reforms that have typically been advocated to address WASH service delivery challenges have tended to steer clear of the broader governance context in which service providers and local government bodies operate. However, in the foreseeable future and for rural services in particular, a large majority of service providers will not be corporatized entities and will continue to operate squarely within government. They will therefore continue to be influenced by politics and the existing public management systems that include policy making, public financial management, public investment management, human resource management, and intergovernmental arrangements. As a result, the functioning of state organizations and institutional arrangements that typically lie outside the purview of water practitioners cannot be ignored. The 2017 *World Development Report* (World Bank 2017a) highlights three functions needed for inputs and policies to deliver effective outcomes: commitment, coordination, and cooperation. These functions in turn are shaped by the incentives, interests, and systems that comprise the enabling environment. To achieve the SDGs, the next generation of reforms and interventions will need to be cognizant of the "operating environment" that places limits on the room for maneuver and change.

Drawing on the literature on governance and institutional reform,[6] the WASH Poverty Diagnostic Initiative sought to identify both proximate and binding constraints to the delivery of WASH services. Using a problem-driven approach, the key service delivery problem(s) identified in the 18 country-level diagnostics[7] provided the starting point for this exercise (see appendix B). For example, in *Nigeria* the key problems identified were a decrease in access to piped water through household connections in urban areas (prompting efforts to self-supply), and the high postconstruction failure rates of water points in rural areas. In *Indonesia*, urban water utilities are unable to extend services to those without access and provide good-quality services to those who already have access.

In the Initiative's problem-driven approach, "problems" are not articulated in the form of "solutions," for example, that a utility is not corporatized or that services are not decentralized. Instead, the approach provides a methodology for identifying technically and politically feasible sets of reforms that target the service delivery problem. Also, it is relatively agnostic about what might work in a particular context and does not take a normative position on reform solutions.

After identifying the service delivery problem(s) of a given country, the Initiative critically evaluated the institutional arrangements for service delivery and the gaps between policy and implementation—what Kingdom (2017) described as "the pitfalls between the policy and the pipes." To identify the binding constraints on implementation, the analysis started with a mapping of key functions[8] across different tiers of government and different actors. The mapping was based on the formal, *de jure* arrangements. (The exercise was designed to critically evaluate both the formal, *de jure*, and actual, *de facto*, institutional architecture and practices and to be cognizant of the importance of informal institutions.)

The analysis used three diagnostic lenses to identify constraints and reform options: oversight and accountability (World Bank 2004), intergovernmental arrangements (Boex 2015), and capacity (World Bank 2017b). Looking through the *oversight* and *accountability* lens involves considering the relationships between government, service providers, and citizens/clients. Next, without taking a normative position, the country studies considered weaknesses in *intergovernmental arrangements,* assessing both the *de jure* and *de facto* authority and power at different levels/tiers of government to undertake the assigned functions.

This part of the analysis draws on the three standard dimensions for assessing intergovernmental arrangements—political, fiscal, and administrative. Finally, weaknesses in the *capacity* of the entities/organizations involved in the delivery of services were evaluated. (Note here that capacity encompasses both financial capacity, that is, sector financing, as well as the capacity of relevant personnel, including end users to the degree that they are responsible for covering O&M costs.) Considering all three of these conjoined lenses is important, since binding constraints to service delivery problems—and viable reform options—are likely to involve all three.

Emerging Findings

The analysis reported here focuses on the following subset of the 18 economies for which an institutional diagnostic was carried out: *Bangladesh, Ethiopia, Guatemala, Indonesia, Mozambique, Niger, Nigeria, Panama, Tanzania,* and the *West Bank and Gaza.* Evidence from the other countries is reported subject to availability and relevance.

Oversight and Accountability

The *World Development Report* for 2004 (World Bank 2004) provided influential analysis of why countries fail to deliver basic public services to their citizens, highlighting the previously ignored roles of politics and accountability. Its framework is built around three core relationships— between citizens and service providers; service providers and policy makers/politicians; and policy makers/politicians and citizens. The report promoted a "short route" to accountability, through which citizens exercise their "client power" to hold service providers directly to account. This is contrasted with the more traditional but often less effective "long route," through which citizens influence public service provision by working through representative political institutions (that give them "voice") and policy makers influence frontline service providers through a "compact" delegating resources and responsibility.[9]

Rural water provision in many countries does not fit neatly into the accountability framework of the 2004 *World Development Report,* since water users themselves play an important role in service provision. For example, in *Tanzania*, community-owned water supply organizations (COWSOs) are simultaneously agents of the community and of the local government. Lines of accountability are blurred where it is difficult to distinguish between water users and water providers. *Guatemala* offers another example of the same phenomenon: although municipalities are legally responsible for providing WASH services in rural areas, communities generally build, operate, and maintain their own systems through drinking water committees.

Where foreign aid plays a large role, this can also blur the lines of accountability. Such is the case in *Tanzania*, where foreign funding contributed between 70 to 80 percent of the total water budget in 2007-13 (Development Partners Group 2014; Quinn and Tilley 2013).

Intergovernmental transfers can also complicate the relationships of accountability and limit the scope for client power. In *Nigeria*, states rely on transfers from the federal government to finance their budgets. The amount and timing of these transfers are often difficult to predict, resulting in discretionary cash rationing that limits state water agencies' access to funds. When these agencies simply lack the funds to deliver good-quality services, they cannot be held directly to account.

In addition, information asymmetries make it difficult for water users to know what they can reasonably demand from the state when it comes to improved service provision. This is often a consequence of ambiguous policies. Information asymmetries exist at many levels, precluding citizens from monitoring the quality of services as well as the budget allocation process. In *Guatemala*, due to the limited information on the standards and levels of service that clients can expect, the long route of accountability breaks down. Because regulations are incomplete,

the responsibility for understanding services and monitoring delivery is borne by citizens, who do not have information to evaluate the quality and coverage of WASH services. Without information on performance, it is not possible for citizens to raise their voices effectively.

The nature of political competition in a country also limits the ability of water users to influence their elected representatives. For example, the Ethiopian People's Revolutionary Democratic Front (EPRDF) and allied regional political parties dominate *Ethiopia's* political system at both the national and local levels. Thus, while local councilors are responsible for service delivery and theoretically should be responsive to local needs, there is a widespread view that senior party members' instructions and targets overshadow local concerns.

In other cases, WASH service delivery is not politically salient, which reduces the effectiveness of citizens' voices. For instance, in *Indonesia*, mayoral incumbents and candidates do not appear to regard urban water as a key issue on which to demonstrate performance to secure (re)election. This may be because some elements of local government-owned water utilities' performance, such as poor water quality, are not immediately visible to consumers, thereby reducing the incentives for local leaders to improve service delivery by chlorinating the water.

The obstacles to accountability relate back to the *service characteristics* of water and sanitation—that is, both the "supply-side" factors affecting the incentives that politicians have for improving service delivery, as well as the "demand-side" factors affecting the likelihood that citizens make claims on the state for improved service delivery. In *Nigeria*, resources at the federal level are allocated on the basis of garnering political support rather than on prioritizing where people's needs are greatest. To garner and maintain political support, politicians often favor new construction rather than maintaining existing infrastructure.

On the demand side, the frequency and predictability of demand for drinking water, along with the fact that water consumers are defined territorially, creates scope for water users to coalesce around service issues and therefore in theory raises the likelihood that users will make claims on the state. That said, only a subset of water users (women and girls) is typically involved in the daily collection of water in most countries, including *Tanzania* and *Niger*, and thus aware of the particular service delivery challenges affecting their communities. For example, in *Niger* women and girls spend almost an hour fetching water every day. Engrained social norms frequently prevent females from advocating individually or collectively for improved services (Mason, Batley, and Harris 2013). As a result, citizens' voices are constrained.

Citizens' voices are also constrained by their limited political influence. Thus, low-income consumers are unlikely to be able to challenge the problems that plague the urban water supply in *Indonesia*, where information asymmetries and other factors prevent them from directly engaging with local governments to demand service improvements. This demand-side constraint also manifests in *Panama*, where rural and especially indigenous populations are systematically excluded from access to quality WASH services. These populations face particular obstacles to any effort to collectively mobilize to protect their interests and to influence policy. The persistence of this "low contestability" (World Bank 2017a) is likely to contribute to the existing mismatch between the *de jure* objective of targeting indigenous communities as a national priority, and the *de facto* reality of the fragmented and inefficient institutional architecture characterizing service delivery in the areas where they live.

Intergovernmental Relations

Decentralization reforms have been implemented in several countries with the objective of making WASH service delivery more efficient and responsive to local needs—largely in response to the failures of centralized provision. However, decentralization has not proved to be a panacea.

Decentralization reforms can face difficult challenges in countries with democratic deficits, where the elite may be reluctant to share resources and authority with lower levels of

government in a meaningful way. The potential benefits of decentralization are often undermined by inadequate devolution of power, particularly over finance and staff; vague and/or inappropriate systems and procedures; underqualified and unmotivated staff; political interference and corruption; and a lack of "downward" accountability—that is, of local politicians to their constituents (Conyers 2007). For instance, in *Ethiopia*, responsibility for rural water provision is based on the principle of subsidiarity whereby service delivery responsibilities are allocated to the lowest possible tier of government, which in theory provides space for water bureaus and local councilors to be responsive to local needs. In this arrangement, councilors must respond to the demands of their electorate and their seniors at the same time. As has been previously noted, the power players in the party hierarchy often dominate local decisions, and are likely to favor highly visible construction projects over necessary maintenance. The situation in *Tanzania* is similar. Furthermore, in many cases funds are allocated from the top down in a nontransparent manner and can reduce citizens' incentive to engage in local politics and hold their locally elected representatives to account for any misuse of earmarked funds (Wunsch 2001).

These tendencies are not unique to Africa. For instance, in the *West Bank*, 27 political and administrative functions (including water and sanitation) have been delegated to local government units (LGUs), but not fiscal authority. LGUs are not allowed to collect property taxes to finance local services, and the absence of an intergovernmental fiscal transfer system leaves them without a reliable source of revenue. Therefore, LGUs rely on their own revenues from "enterprise services" (such as electricity and water) to finance their general operating budgets. As a result, frequent diversion of revenues from water provision is at the cost of reinvestment in the O&M of water systems and affects the quality of services.

Even where relations between different levels of government have been deconcentrated,[10] they may not be functional. For instance, in *Mozambique*, management of donor-financed rural water sector investments by the National Directorate of Water Supply and Sanitation (DNAAS) appears to impede the execution of sector plans. Although subnational agencies have been notably more efficient than DNAAS at executing donor funds for rural water, the directorate is reluctant to see the further deconcentration of funds to provinces or districts. The centralization of sector finances within DNAAS reinforces its position as the principal coordinating agency for rural water and amplifies its importance among both donors and local state agencies alike. A significant shift in financial transfers away from DNAAS and toward direct provincial allocations, for example, would enable DNAAS staff to better concentrate their efforts on their formal policy-making role instead of the busywork of reporting to donors, but potentially at a cost to their status in the sector. The government of Mozambique may also be reluctant to empower local governments in areas associated with the political opposition.

Intergovernmental arrangements can also create ambiguity and opportunities for capture in the budgeting process. In *Mozambique*, the planning, budgeting, and allocation process is not transparent—especially at the central level. Provincial budgetary allocations, and how these investments are distributed among districts, are not based on transparent criteria or formulas and are subject to change during the budget approval and execution stages at the national level. At each stage of the planning process, political actors and appointed administrators have considerable discretionary power to influence the final plans and submitted budget, and, as such, how allocations are disbursed, limiting the ability of citizens to influence the allocation process.

There are also instances when policies overlap or contradict one another, making it difficult for water users, local government officials, and other stakeholders to know which procedures to follow and who has authority over what. This is particularly so when sector policies have been developed independent of cross-cutting policies for, say, local governments. This may be understood as a failure of coordination (World Bank 2017a) and may also be a consequence of isomorphism[11] to the extent that policies have been developed to reflect international standards and donor preferences rather than the local context.

For instance, in *Tanzania* authority for service provision is characterized by a contradiction between the Local Government Acts and the Water and Sanitation Act. A review of the different laws reveals clear overlap of functions and responsibilities between urban local government authorities and water supply and sanitation authorities, which are independent corporate bodies under the authority of the Ministry of Water. This makes the role of the elected local government leadership unclear when it comes to providing water and sanitation services in urban areas. This ambiguity reflects broader tensions between sector reforms and overarching decentralization reforms, as well as a centralizing tendency of the government, aimed in part at keeping the country's long-standing ruling political party in power.

In the *West Bank and Gaza*, the Local Government Act of 1997 explicitly allocates water and sanitation provision to LGUs, while the 2014 Water Law seeks to extract water service provision from being embedded in LGUs. While in theory the 2014 law supersedes the 1997 one, water departments have yet to be moved outside LGUs.

In *Bangladesh*, while the legal framework assigns responsibilities to different levels of government and to agencies within these, there are a number of overlaps. For example, local governments are allocated responsibility for water and sanitation and at the same time the national Department of Public Health Engineering (DPHE) is also tasked with carrying out activities in the sector. There is also lack of clarity between the respective jurisdictions of the DPHE and the Local Government Engineering Department (LGED), which are both departments of the Ministry of Local Government, Rural Development, and Cooperatives.

Capacity

Capacity may be understood as "the availability of resources and the efficiency and effectiveness with which societies deploy these resources to identify and pursue their development goals on a sustainable basis" (World Bank 2017b: 4). Capacity can be usefully unpacked into two elements: (i) the stock of human, financial, and technical skills and resources; and (ii) a broader set of institutional factors that enable (or constrain) the development of capacity stock and its ultimate conversion into development outcomes. For example, if the government's key responsibility in rural sanitation is promoting behavioral change, strengthening the technical capacity of water engineers would not address this.

In some cases, implementation gaps are due to weak capacity of (local) governments and other implementing agencies that frequently lack the resources, personnel, and know-how to effectively implement the responsibilities that have been devolved to them. Weak local capacity is often reflected in the underspending of allocated funds. For example, over the past decade *Niger* spent only $6.80 per capita on WASH, despite a voted budget of $11.80 per capita—an execution rate of under 60 percent. *Guatemala's* level of execution of WASH investments did not exceed 50 percent in any of the past three years (2013–15) for which data are available, and was only 17 percent in 2015. Likewise, in *Ethiopia* 38 percent of the local budget and 35 percent of the regional budget for rural water supply was not used (World Bank 2016).

Distortionary staffing of national WASH ministries similarly burdens government capacity to deliver services. In 2014, *Niger* created a regulatory body within the Ministry of Water and Sanitation. To date, it has a director but no other staff, and the minimum resource requirements are lacking. Meanwhile, 27 of the 31 staff members within Niger's Department for Hygiene and Sanitation (within the Ministry of Health) are at the highest rank level in the administration. But most of these staff members serve in border posts (including at airports) (Government of Niger, Ministry of Health, n.d.), making the prospect of addressing the high levels of open defecation in rural areas unrealistic.

The financial capacity of water users also represents a challenge. For instance, in *Tanzania*, the financial capacity of COWSOs to cover O&M costs is a key driver of the failure to maintain existing and newly constructed infrastructure for water provision. Specifically, COWSOs are

constrained by their reliance on the contributions of water users. In many rural wards, the majority of residents survive on less than $1.25 per day. Furthermore, many Tanzanians lack regular access to cash, which can put even seemingly manageable contributions out of reach. As a result, the likelihood that such users will pay for water is quite low. Recent estimates suggest that nearly two-thirds of all water users never pay for the services they use. Not surprisingly, the functionality of water schemes that benefit from users' payments is better than those that don't.

Similarly, in *Ethiopia*, financing of O&M and other life-cycle costs is a major problem. The assumption that low-income users across the country are able to self-fund and undertake most O&M is questionable, even though the sustainability of the Government of Ethiopia's WASH program depends on this.

A Need to Do Business Differently

The efforts to identify service delivery constraints outlined above resulted in two key observations. First is the recognition that some dysfunctions in service delivery, in particular to poor and vulnerable people, persist even though solutions to these problems may seem obvious. Second, political, institutional, and capacity constraints—some of which may, by design, serve the interests of those in power—have led to a waste of scarce resources.

The WASH Poverty Diagnostic Initiative began by identifying the service delivery problem in question—for example, that assets are not adequately maintained, or that poor people do not have access to services even when they are willing to pay for them. Importantly, the starting point was not a preferred "solution," such as corporatization, decentralization, or community management. This focus on the problem represents a departure from traditional reform approaches, which have often focused on preferred organizational forms. Instead, the approach seeks to learn from past mistakes. While elements of a traditional reform package may end up being recommended as a way forward, the proposed approach focuses on identifying the proximate and binding constraints (some of which may be in the broader public management sphere) that if mitigated would overcome the service delivery problem in question.

Looking across a subset of 10 of the 18 countries, a set of common themes emerge. The constraints to WASH service delivery identified by the Wash Poverty Diagnostics have been identified by others in the literature,[12] and reflect broader challenges of decentralized service delivery in low-income settings.[13]

First, and as has been noted, information asymmetries and a lack of transparency frequently make it difficult for end users to know what they can reasonably expect and demand from service providers and politicians. Such a lack of information is compounded by constraints on the ability of the bottom 40 percent (B40) of a nation's wealth distribution to effectively voice their concerns, reducing the accountability of service providers and policy makers to the citizens they exist to serve.

As a result, the visibility of outputs tends to drive the priorities of policy implementation. Among other challenges, this creates incentives to construct new infrastructure, rather than invest in the O&M of existing infrastructure or focus on improvements to water quality. A lack of visibility also drives political reluctance to prioritize demand creation for sanitation (as opposed to highly visible subsidies to finance infrastructure).

The fact that water and sanitation services have been only partially decentralized in many of the cases also creates challenges for implementation. Many of the country cases reveal poor coordination across different implementing bodies. The multiplicity of actors and lack of clarity in terms of functional assignments frequently results in gaps and overlaps in policy, blurring lines of accountability. In addition, decentralized service delivery arrangements frequently result in local governments failing to perform their assigned responsibilities, with serious

implications for monitoring, oversight, budget execution, and efficient (needs-based) targeting. Such failures are frequently driven by a transfer of responsibilities to the local level without commensurate transfer/availability of resources. The failure to sufficiently resource local governments is frequently political—reflecting a reluctance on the part of the central government to meaningfully share power. Thus, in addition to the horizontal coordination across ministries in government discussed in chapter 3, better (vertical) coordination between levels/tiers of government is critical for improving efficiency in resource use.

Finally, the 10 countries are characterized by substantial cost-recovery issues. In a number of cases, water users lack the financial capacity to cover O&M—a responsibility that has been devolved to them for most rural water supply schemes in line with the "demand-responsive approach."[14] Politicians in urban areas frequently intervene when it comes to setting tariffs at rates that would facilitate cost-recovery.

Critically, however, *the identification of common constraints does not justify the application of common solutions*. For example, having seen that weak local government capacity is a common challenge across a range of settings and subsectors, it would seem obvious to recommend interventions to build the capacity of local government actors involved in the delivery of WASH services. However, such a recommendation might not succeed if it did not consider the political factors driving such weaknesses. To the extent that local government capacity reflects reluctance on the part of the central government to meaningfully devolve resources, an effective intervention might rather focus on engaging with relevant central government actors (such at the Ministry of Finance or the ministry responsible for local governments). This example illustrates what is meant by "doing business differently."

A problem-driven approach is necessarily context driven, and—perhaps frustratingly—means that would-be reformers cannot begin with a prepackaged toolkit of tried-and-tested reforms. Rather, the proposed approach necessitates beginning with a well-identified service delivery problem and identifying the broader governance context within which it manifests. Tools such as power mapping and political economy analysis can help to identify the relevant actors whose incentives can potentially be shifted in a manner to facilitate more efficient and equitable outcomes. This approach may be unsatisfying for those looking for quick fixes and grand reforms, but a failure to consider the broader governance context almost certainly keeps the SDGs out of reach.

If the world is to achieve the water and sanitation SDGs, donors need to better understand the (political) reasons for the disconnect between stated policy commitments and the reality on the ground in many countries. As noted in the 2017 *World Development Report* (World Bank 2017a: 11), "Even if physical and administrative capacity exists, policies may still be ineffective if groups with enough bargaining power have no incentives to pursue implementation." If the efficiency of resource use is to be enhanced, sector practitioners need to approach their business somewhat differently by looking beyond infrastructure and services to paying more attention to the institutions that "manage the pipes"—and the distribution of power that influences how these institutions perform in practice.

Notes

1. "Water points" refer to the point sources that account for most of the water supply infrastructure in rural areas in many developing countries. These include communal standpipes, hand pumps, and improved springs.
2. This chapter draws on findings from the various country-specific WASH Poverty Diagnostics without citation. Citations are provided where examples are drawn from other sources.
3. See also Kooy and Harris (2012) and Tilley (2013).
4. Institutions are the "humanly devised constraints that shape human interaction" (more commonly referred to as the "rules of the game") and organizations are "groups of individuals bound by some common purpose to achieve objectives" (North 1990). Intergovernmental arrangements, regulations, and so on form the institutional architecture.

5. Note that the WASH Poverty Diagnostics on which this chapter draws are typically focused on just one or two of these services (see table C.1 in appendix C).
6. See, for example, World Bank (2012a, b); Andrews, Pritchett, and Woolcock (2017); and Teskey (2017).
7. As noted in the introductory chapter to this report, the WASH Poverty Diagnostic Initiative addressed four main questions for the 18 economies surveyed. Service delivery problems corresponded primarily to the first two questions: "1. Who and where are the poor and vulnerable populations?" and "2. What is their level of access to WASH services, and of what quality, relative to better-off segments of society?"
8. These vary by service, but generally include policy/regulation, planning/budgeting, financing, human resources, provision, and production.
9. For some perspective on the shortcomings of the original approach, as outlined by one of its authors, see World Bank (2014).
10. "Deconcentration" (distinguished from "devolution") refers to the transfer of decision-making authority and responsibility for public functions to lower territorial administrative tiers of the *central government.*
11. Drawing on the work of DiMaggio and Powell (1983), Andrews, Pritchett, and Woolcock (2013: 2) use the term "isomorphic mimicry" to describe cases where countries have adopted "the camouflage of organizational forms that are deemed successful elsewhere to hide their actual dysfunction." Here, the concept is extended to policies.
12. For example, Herrera and Post (2014) document political interference with tariff setting across a range of urban settings. Koehler, Thomson, and Hope (2015) note that operations and maintenance of rural water infrastructure has barely improved despite widespread adoption of DRA principles. In a study of 15 countries in Sub-Saharan Africa, they find that in spite of the official decentralization of water provision in most cases, the devolution of responsibilities to local governments has not been accompanied by sufficient authority and resources.
13. Synthesizing case studies that provide detailed data on service delivery in Africa, Conyers (2007) finds that the potential benefits of decentralization are often undermined by inadequate devolution of power, particularly over finance and staff; vague and/or inappropriate systems and procedures; underqualified and unmotivated staff; political interference and corruption; and a lack of "downward" accountability (of local politicians to their constituents).
14. This approach, whereby water users are supposed to demand, own, and maintain their water services and participate in their design, has emerged as the leading paradigm for rural water supply in recent decades (Koehler et al. 2015). This reflects international consensus around the "Dublin Principles," advanced at the International Conference on Water and the Environment (ICWE), Dublin, Ireland, in January 1992, which recognized water as an "economic good."

References

Andrews, M., L. Pritchett, and M. Woolcock. 2013. "Escaping Capability Traps through Problem Driven Iterative Adaptation (PDIA)." *World Development* 51: 234–44.

———. 2017. *Building State Capability: Evidence, Analysis, Action*. United Kingdom: Oxford University Press.

Baietti, A., W. Kingdom, and M. van Ginneken. 2006. "Characteristics of Well-Performing Public Water Utilities." Water Supply and Sanitation Working Note No. 9, World Bank, Washington, DC.

Boex, J. 2015. "The Vertical Assignment of Functions and Expenditure Responsibilities." LPSI Working Paper, Local Public Sector Initiative, Virginia. http://www.localpublicsector.net /docs/LPSI_WP_Functional_Assignment_May2015.pdf.

Conyers, D. 2007. "Decentralisation and Service Delivery: Lessons from Sub-Saharan Africa." *IDS Bulletin* 38 (1): 18–32.

Development Partners Group. 2014. "Water Sector RBA FY 2013/14." Drafted by Goodluck Mosha (Consultant-PREM) and Nsaaiya Kihunrwa (DPG water Secretariat) with inputs from Andrea Moser (KfW).

DiMaggio, P., and W. W. Powell. 1983. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48 (2): 147–60.

Estache, A., and L. Wren-Lewis. 2009. "Toward a Theory of Regulation for Developing Countries: Following Jean-Jacques Laffont's Lead." *Journal of Economic Literature* 47 (3): 729–70.

Herrera, V., and A. Post. 2014. "Can Developing Countries Both Decentralize and Depoliticize Urban Water Services? Evaluating the Legacy of the 1990s Reform Wave." *World Development* 64: 621–41.

Kingdom, W. 2017. Personal conversation with authors.

Koehler, J., P. Thomson, and R. Hope. 2015. "Pump-Priming Payments for Sustainable Water Services in Rural Africa." World Development. Volume 74, October 2015, Pages 397-411

Kooy, M., and D. Harris. 2012. *Political Economy Analysis for Water, Sanitation and Hygiene (WASH) Service Delivery*. United Kingdom: Overseas Development Institute.

Laffont, J. J. 2005. *Regulation and Development*. Cambridge and New York: Cambridge University Press.

Locussol, A., and M. van Ginneken. 2008. "Template for Assessing the Governance of Public Water Supply and Sanitation Service Providers." Water Working Note, World Bank, Washington, DC.

Mason, N., R. Batley, and D. Harris. 2013. *The Technical is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Drinking Water Services*. United Kingdom: Overseas Development Institute.

North, D. C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge, United Kingdom: Cambridge University Press.

Quinn, A., and H. Tilley. 2013. *Rapid Budget Analysis of the Water Sector in Tanzania*. London: Overseas Development Institute.

Teskey, G. 2017. "Thinking and Working Politically: Are We Seeing the Emergence of a Second Orthodoxy?" Unpublished mimeo.

Tilley, H. 2013. *Unblocking Results in Tanzanian Rural Water Supply*. United Kingdom: Overseas Development Institute.

World Bank. 2004. *World Development Report 2004: Making Services Work for Poor People*. Washington, DC: World Bank.

———. 2012. "The World Bank's Approach to Public Sector Management 2011-2020: Better Results from Public Sector Institutions." Working Paper, World Bank, Washington, DC. http://siteresources.worldbank.org/EXTGOVANTICORR/Resources/3035863 -1285601351606/PSM-Approach.pdf.

———. 2014. "What the 2004 WDR Got Wrong?" *World Bank blog.* http://blogs.worldbank .org/futuredevelopment/what-2004-wdr-got-wrong.

———. 2016. *Ethiopia Public Expenditure Review*. Washington, DC: World Bank.

———. 2017a. *World Development Report 2017: Governance and the Law*. Washington, DC: World Bank.

———. 2017b. "Discussion Note: What's Next for Capacity Building in Africa?" World Bank, Washington, DC, April 2017.

Wunsch, J. S. 2001. "Decentralization, Local Governance and 'Recentralization' in Africa." *Public Administration and Development* 21 (4): 277–88.

Chapter 6
By Way of Conclusion: Looking Toward the Sustainable Development Goals

A major lesson learned from the water supply, sanitation, and hygiene (WASH) Poverty Diagnostic Initiative is the need to think and work differently to address inequalities and constraints in the delivery of WASH services that hinder human development. The initiative draws from all possible data sources but also contributes new ones (notably in relation to water quality) to triangulate the analysis and ascertain the facts. Specific lessons from the Initiative are described below.

Working Together to Protect the Foundations of Development

- Coordinated investments that span WASH services, health services, and nutrition can do more to reduce undernutrition, stunting, morbidity, and mortality from diarrheal disease than uncoordinated efforts or WASH investments alone.

- New tools such as the mapping of multiple forms of deprivation help identify populations that are at highest risk of mortality from diarrhea. Mapping where current investments in WASH, health, and nutrition are being made at the country level, and comparing those investments to the burden of disease, is a logical first step.

Invest More, Target it with Precision, and Allocate it Efficiently

- More money was needed under the Millennium Development Goals to reach universal access to WASH services and to gradually eliminate inequalities in service provision. Even more will be required under the Sustainable Development Goals (SDGs). On average, the world is currently investing between 0.2 and 0.4 percentage points of gross domestic product (GDP) in WASH services. To achieve the SDGs, countries will need to invest at least four times their current capital investment levels.

- To reduce inequalities in WASH services between more and less vulnerable groups, resources must be targeted in a more efficient manner. The WASH Poverty Diagnostic Initiative offers new insights on how to use data in innovative ways to identify areas in most need.

- Aligning actions with policy statements is key. There are significant gaps between policy intentions and actions, as reflected in actual budget allocations. Careful planning and more efficient implementation are key to achieving the universal aspirations proposed by

the SDGs, with special attention to the most vulnerable populations. However, the distribution of power within a country often results in resource allocations that ignore the interests of the poor and vulnerable. Further, weaknesses in the institutional arrangements for service delivery lead to inefficient and wasteful expenditures. Thus the political economy that characterizes the policy arena and the institutional arrangements for service delivery merit more attention than they currently receive.

- The Initiative reveals several examples of inefficient resource use, from dysfunctional infrastructure to underutilization of allocated resources. Addressing these inefficiencies will be critical if progress is to be made on the SDGs. This will require urban water service providers to become more efficient. It will also require governments to allow water providers access to private capital, to free up fiscal space in state coffers to invest in expanding access in areas where people's ability or willingness to pay for services is low (for example, for urban sanitation, rural sanitation, and rural water), and to support operations and maintenance to ensure that capital investments reach their maximum life span.

Mind the Gap from Policy to Pipes

- The findings from the Initiative demonstrate that there is a need to better understand the broader governance and institutional environment to gain insights into why bad outcomes persist and to identify feasible entry points for changing the status quo.

- A pragmatic approach that has a greater probability of success would involve a shift from "best practice" reform packages to context-specific "best fit" reforms that "work with the grain"[1] of the prevailing political economy and capacity constraints. Such reform efforts are likely to be incremental but arguably more successful than reforms based strictly on international best practices. Instead of trying to change the operating environment, the suggestion here is to be cognizant of the political and technical constraints and find ways to better *navigate* the operating environment.

- Traditional reform approaches have often focused on forms of organization—for example, corporatization of water service providers to improve efficiency. Analysis from the Initiative finds that water service providers with the same corporate form in the same country can function very differently. On the other hand, there are examples of well-functioning water service providers that are not corporatized and are embedded in the government. What might be the reasons for this? This suggests a need to shift the focus from form to function.

- If resources are to be used more efficiently, development practitioners need to approach business differently by paying more attention to the institutions that manage the pipes and the political economy that influences how these institutions perform in practice.

Improve Data Collection and Build Capacity to Track the SDGs

- Harmonizing and improving data collection at the country level will be critical to monitoring the SDG indicators. This means more consistency across national surveys, but also better use of administrative data. Making more information available to the public (for example, on water-quality levels) can reduce information asymmetries.

- Efforts under the Initiative to work with bureaus of statistics in various countries demonstrate that these agencies face significant challenges to collecting the myriad of indicators required for the SDGs. Providing support to these agencies to help them collect data in the most efficient manner will be critical.

The tasks that countries and donor institutions face as they look toward the SDGs may appear herculean. A key reflection from this initiative is that building cross-sectoral collaborations among specialists in water, poverty, health, and governance brings a range of perspectives and new insights to bear, opening the door to thinking and working differently. This report is designed to inspire decision makers and practitioners to increase their collaboration to ensure that goals become realities for the world's most vulnerable people.

Note

1. This idea was introduced by Booth (2011) and Kelsall (2011). Levy (2014) develops a typology of country types along the dimensions of the nature of the political settlement and institutional complexity and describes the kinds of reform efforts that would be consistent with these.

References

Booth, D. 2011. "Introduction: Working with the Grain? The Africa Power and Politics Programme*." IDS Bulletin* 42 (2): 1–10. doi:10.1111/j.1759-5436.2011.00206.

Kelsall, T. 2011. "Going with the Grain in African Development?" *Development Policy Review* 29 (s1): s223–51. doi:10.1111/j.1467-7679.2011.00527.

Levy, B. 2014. *Working with the Grain: Integrating Governance and Growth in Development Strategies*. New York: Oxford University Press.

Appendix A
Methods Used to Measure Inequities and Intersections with Poverty

Human Opportunity Index (HOI). The HOI, created by the World Bank (de Barros et al. 2009), measures the inequality of opportunities. Under the WASH Poverty Diagnostic Initiative, the HOI provided insights into equity in access, as well as the social and human determinants influencing access to WASH services. Specifically, it was used to calculate access to WASH services for children under the age of 16.[1]

UNICEF Synergies. In 1990, UNICEF developed a conceptual framework that identified food security, environmental health, and health care as underlying determinants of undernutrition. The World Bank's poverty economists (Skoufias 2016) have since developed a methodology that uses the UNICEF framework as a guide to contrast adequate conditions with what is observed in household survey data. The WASH Poverty Diagnostic Initiative refined the model to focus on adequate food, care, health, and WASH. The model uses statistical methods to understand the relationships between nutritional outcomes, as measured by a child's height-for-age Z score (HAZ) and underlying factors (Skoufias 2016).

WASH Poverty Risk Model (WASH-PRM). This model was developed with researchers from the London School of Hygiene and Tropical Medicine and the University of Florida, and builds on the work of Rheingans et al. (2012) to assess patterns of disease across different economic and geographic subpopulations of children under 5. The model includes WASH factors (access to water, household sanitation, and hygiene) that influence the risk of diarrheal disease, and susceptibility factors (the acquisition of micronutrients, effective rehydration treatment, and undernutrition) that influence both the risk of infection and mortality due to diarrhea. The model allows us to identify the populations of children under 5 with the highest risk of diarrheal disease, stunting, and mortality, and to look at population patterns and the socioeconomic and geographic distribution of these risks.

Small Area Estimation (SAE). In response to a lack of policy-relevant data on the spatial inequality of WASH services, this initiative invested in research to develop methods for the small area estimation of WASH access. These build on methods used to estimate income poverty for small administrative areas, previously developed by Elbers, Lanjouw, and Lanjouw (2003) and referred to as the ELL approach. The Initiative piloted modern statistical methods (such as the Spatial Autoregressive Lag model) to exploit publicly available satellite imagery data combined with household survey data (such as those of the Demographic Health Surveys, DHS) to estimate WASH access in small areas (Fujii and Vander der Weide 2016). Application of this method was restricted to a pilot in Bangladesh and Nigeria, with an intention to roll it out to all countries covered by DHS. Similar small area estimation techniques were applied using a Bayesian model in Nigeria and Tanzania.

Aside from distribution analysis, econometric methods were applied to unique datasets in individual countries. For example, panel data in Indonesia allowed the team to follow a sample of children through time and assess the nonlinear relationship between community-level

sanitation and these children's height. In Bangladesh, econometric methods were used to assess the relationship between water salinity at source and the school attendance of girls (which was affected by the time required to fetch potable water). Likewise, econometrics were used to assess the relationship between *E. coli* contamination and the height of children using the 2013 Bangladesh Multiple Indicator Cluster Survey. In Niger, econometrics were used to assess the role of climatic shocks on health and the protective effect of access to WASH services.

Finally, the initiative invested in a new way of thinking (at least for water sector practitioners) about service delivery. The aim is to frame problems so as to bridge the gap between the water sector and public sector management professionals (or governance professionals, broadly speaking) whose work is relevant to service delivery. This new way of thinking considers the political economy, the politics of service characteristics (Mcloughlin and Batley 2012; Mason, Batley, and Harris 2014), and the vertical assignment of functions and expenditure responsibilities (Boex et al. 2015; World Bank 2012). It employs a problem-driven approach (Teskey 2017).[2] The initiative supports the idea of shifting from thinking about "best practice" solutions in influencing reforms to first understanding context. Importantly, this coincides with a focus on the *functional* problem rather that what development specialists think the *form* of service provision should look like.

Specifically, the approach recognizes that there are distinct differences in how water and sanitation services are provided across contexts and geographical divides (including urban/rural). It is vital to understand a particular service, and the role of the state in providing that service. As such it is important to map and review the institutional arrangements and organizational structures, both on paper (de jure) and in practice (de facto), that are likely to influence service delivery. To understand the gaps between policy and implementation in the countries studied, the initiative considered: (i) weaknesses in oversight and accountability, (ii) weaknesses in intergovernmental arrangements, and (iii) weaknesses in capacity.

The first two of these focus on the relationships between actors and institutions (that is, "the rules of the game") and the third focuses on the capacity of organizations and entities. A fourth, political economy, involves the entire analysis. Because context matters, entry points for reform need to pass the test of being technically and politically feasible (that is, do they "go with the grain"? [Levy 2014]) if there is hope that reform agendas will be adopted by governments.

This initiative builds on and utilizes an emerging way of thinking about development by starting with a specific problem and asking a range of questions regarding why services are failing. This will help understand why low equilibriums persist and what incentive structures support the status quo.

Notes

1. For more information on the HOI, visit http://www1.worldbank.org/poverty/visualizeinequality/index.html.
2. This report has three guiding principles—doing development differently, thinking and working politically, and the problem driven iterative adaptation outlined by Andrews, Pritchett, and Woolcock (2013)—which may be contrasted against the "Washington Consensus" and best practice orthodoxy.

References

Andrews, M., L. Pritchett, and M. Woolcock. 2013. "Escaping Capability Traps through Problem Driven Iterative Adaptation (PDIA)." *World Development* 51: 234–44.

Boex, J. 2015. "The Vertical Assignment of Functions and Expenditure Responsibilities." LPSI Working Paper, Local Public Sector Initiative, Virginia. http://www.localpublicsector.net /docs/LPSI_WP_Functional_Assignment_May2015.pdf.

de Barros, R. P., F. H. G. Ferreira, J. R. Molinas Vega, and J. Saavedra Chanduvi. 2009. *Measuring Inequality of Opportunities in Latin America and the Caribbean.* Washington, DC: World Bank.

Elbers, C., J. O. Lanjouw, and P. Lanjouw. 2003. "Micro–Level Estimation of Poverty and Inequality." *Econometrica* 71 (1): 355–64.

Fujii, T., and R. Vander der Weide. 2016. "Is Predicted Data a Viable Alternative to Real Data?" Policy Research Working Paper WPS 7841, World Bank, Washington, DC.

Levy, B. 2014. *Working with the Grain: Integrating Governance and Growth in Development Strategies.* New York: Oxford University Press.

Mason, N., R. Batley, and D. Harris. 2014. *The Technical is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Sanitation Services.* United Kingdom: Overseas Development Institute.

Mcloughlin, C., and R. Batley. 2012. "The Effects of Sector Characteristics on Accountability Relationships in Service Delivery." Working Paper 350, Overseas Development Institute, London. http://bitly.com/1E8UStF.

Rheingans, R., O. Cumming, J. Anderson, and J. Showalter. 2012. *Estimating Inequities in Sanitation-Related Disease Burden and Estimating the Potential Impacts of Pro-Poor Targeting.* London: Sanitation and Hygiene Applied Research for Equity (SHARE) Consortium/ London School of Hygiene and Tropical Medicine.

Skoufias, E. 2016. "Synergies in Child Nutrition: Interactions of Food Security, Health and Environment, and Child Care." Policy Research Working Paper Series 7794, World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/25039.

Teskey, G. 2017. "Thinking and Working Politically: Are We Seeing the Emergence of a Second Orthodoxy?" Unpublished mimeo.

World Bank. 2012. "The World Bank's Approach to Public Sector Management 2011-2020: Better Results from Public Sector Institutions." Working Paper, World Bank, Washington, DC. http://siteresources.worldbank.org/EXTGOVANTICORR/Resources/3035863-1285 601351606/PSM-Approach.pdf.

Appendix B
The WASH Poverty Risk Model

This appendix is drawn from a background paper by Rheingans et al. (2017).

Exposure—Service Levels for Water and Sanitation

Under the Millennium Development Goal (MDG) target for water and sanitation, access to these two services was classified as "improved" or "unimproved," with progress on "improved" services contributing to progress in meeting the MDG target (WHO/UNICEF 2015). This binary classification of water and sanitation into "improved" and "unimproved" masks a gradient of ascending service levels that brings differing levels of health and other benefits. More recently, the water supply, sanitation, and hygiene (WASH) sector has moved to a "service ladder" approach that better describes water and sanitation access as a continuum of ascending levels assumed to bring ascending benefits. The new Sustainable Development Goal (SDG) to "ensure access to water and sanitation for all" by 2030 goes beyond unimproved/improved to call for safely managed water and sanitation services.

In understanding the risk posed by inadequate water and sanitation access to different groups it is important to consider multiple service levels or "exposure" scenarios that distinguish between, for example, improved sanitation and a sewered connection, and allow for different relative risks of a given health outcome for each exposure level. Many systematic reviews pool different WASH interventions to arrive at a single relative risk estimate for all interventions within a given category (water, sanitation, and hygiene) against a single counterfactual of "no intervention," often failing to account for differences in service level and the control scenario (Fewtrell et al. 2005).

Two previous efforts to assign relative risks (RRs) to various WASH exposure scenarios applied literature-based estimates to an ascending level of single and then multiple WASH services, but only distinguished between one or two levels of water and sanitation service (Prüss et al. 2002; Cairncross and Valdmanis 2006). For the WASH Poverty Risk Model (PRM), exposure scenarios were adopted along with accompanying RR estimates proposed in a recent burden-of-disease analysis led by the World Health Organization (Prüss-Ustün et al. 2014). These RRs are based on a metaanalysis derived from a systematic review of various WASH interventions corresponding to the different exposure scenarios or service levels.

For both water and sanitation, the World Bank's Access Plus framework was considered in developing the service-level scenarios. In order for a particular water or sanitation service level to be included in the PRM analysis there are two criteria that must be met. First, there needs to be a published RR estimate for the service level based on a systematic review of the pooled analysis of appropriately designed studies. Second, household data from Demographic Health Surveys (DHS) or Multiple Indicator Cluster Surveys (MICS) should be used to estimate exposure—or coverage—at a given service level. Taking account of these two criteria, and a desire to align, where possible, with the Access Plus framework that informs question 2 posed by the WASH Poverty Diagnostic Initiative, three service levels are used for both water (table B.1) and sanitation (table B.2). These can be combined to describe a number of exposure scenarios with varying degrees of diarrheal disease (table B.3).

Table B.1: Water Service Levels in the WASH Poverty Diagnostic Initiative

Reference	Relative risk (Wolf et al. 2014)	Service level	Access plus	Access plus notes	DHS Phase 6 & 7 questionnaire coding categories	Description
A	1.00	Unimproved	0	Equal	101: 32,42,61,71,81,91	"Dug well: Unprotected Well," "Water from Spring: Unprotected Spring," "Tanker Truck," "Cart with Small Tank," "Surface Water (River/Dam/Lake/Pond/Stream/Canal/Irrigation Channel),"
B	0.89	Off-plot improved	1 & 2	Combines Tier 1 and 2 as improved at any distance (</>30 mins)	101: 13,14,21,31,41,51	"Piped Water to Neighbour," "Public Tap/Standpipe," "Tube Well or Borehole," "Dug Well: Protected Well," "Water from Spring: Protected Spring" and "Rainwater"
C	0.77	On-plot piped	3,4 & 5	Similar to combined Tiers 3-5 as 'piped on plot' without distinguishing availability or quality; effectively assigns lower bound estimate of RR to this group	101: 11,12	"Piped into Dwelling" or "Piped to Yard/Plot"

Source: Wolf et al. 2014.

Table B.2: Levels of Sanitation Service in the WASH Poverty Diagnostic Initiative

Reference	Relative risk (Wolf et al. 2014)	Service level	Access plus	Access plus notes	DHS Phase 6 & 7questionnaire coding categories	Description
A	1.00	Unimproved	0	Equivalent to MDG 'unimproved' except flush toilet and toilet to "don't know where" is unimproved	109:14, 15,23,41,51,61	"Flush or pourflush toilet: Flush to somewhere else/Flush know where," "Pit Latrine: without slab/open pit "Bucket Toilet "Hanging Toilet/ Hanging Latrine," No Facility/Bush/ Field
B	0.84	Improved (excluding sewered)	1 & 2	Equivalent to MDG 'improved'/SDG 'basic'	109: 11, 12,13,21,22,31	"Flush or pour flush toilet: Flush to septic tank/pit Latrine: VIP/with slab," "Composting toilet"
C	0.31	Sewered house connection	3, 4 & 5	Similar to combined 3-5 Tiers as "safely managed" without distinguishing other access criteria (handwashing station and MHM)	109: 11	Flush or pour flush toilet:flush to piped Sewer system"

Source: Wolf et al. 2014.

Table B.3: Illustrative Exposure Scenarios

Scenario	Water	Relative risk (Wolf et al. 2014)	Sanitation	Relative risk (Wolf et al. 2014)	Combined relative risks
No improved water access, **no improved sanitation access**	A	1.00	A	1.00	**1.00**
Improved off-plot water access, **no improved sanitation access**	B	0.89	A	1.00	**0.89**
No improved water access, **improved sanitation access**	A	1.00	B	0.84	**0.84**
Improved off-plot water access, **improved sanitation access**	B	0.89	B	0.84	**0.75**
Piped on premise, **improved sanitation access**	C	0.77	B	0.84	**0.65**
Piped on premise, **sewered sanitation**	C	0.77	C	0.31	**0.24**

Source: Rheingans et al. 2017.

Water

Point-of-use water treatment scenarios are excluded due to the challenges of estimating adequate compliance and the questionable reliability of the RR estimates (Schmidt and Cairncross 2009). Therefore, only four of the six exposure scenarios are used: unimproved water, improved community source, basic piped and piped water, and piped water higher quality. It is important to include a piped, higher quality water service exposure category (piped, on-plot, continuous) as this corresponds to an optimal service level. However, the evidence of its role in underpinning the RR estimate is limited.

Sanitation

For sanitation, three exposure scenarios proposed by Wolf et al. (2014) were adopted (table B.2): unimproved sanitation (including open defecation), improved but no sewer (onsite), and sewer connection (reticulated, offsite). One limitation of these three scenarios is not distinguishing between open defecation and basic and unimproved on-site sanitation. While it has been assumed that any shift from open defecation to fixed point defecation is protective of diarrheal disease, recent experimental studies provide no evidence for this assumption (Clasen et al. 2014; Patil et al. 2014; Pickering et al. 2015).

Combined Water and Sanitation Exposure Scenarios

Previous efforts to create combined water and sanitation scenarios have either constructed models with literature-derived RR estimates for a limited number of WASH combined exposure scenarios (Prüss et al. 2002; Cairncross and Valdmanis 2006) or have used a *post hoc* method for combining multiple burden of disease estimates for clustered risk factors (Lim et al. 2012; Prüss-Ustün et al. 2014). For the WASH PRM, neither of these approaches would work well. There are insufficient rigorous epidemiological studies to derive reliable RRs for each combination of the water and sanitation exposure levels considered here. And, as the

model includes various other factors that modify the relationship between WASH conditions and diarrheal disease (for example, undernutrition), Lim's approach cannot be applied (Lim et al. 2012).

Estimated RRs for combined water and sanitation scenarios were calculated by multiplying the literature-derived RRs (see tables B.1 and B.2). Table B.3 shows illustrative examples of the RRs for different scenarios combining various water and sanitation service levels. This approach assumes that the RRs of the individual interventions are independent, an assumption that can be tested in the validation analysis described below. This approach has a number of limitations. For example, some interventions lie on the same exposure pathway but interrupt transmission at different points. In this case, the effect may not be additive. However, the RR estimates compare well with previous literature-derived and modeled estimates, and they are consistent.

Susceptibility

The model includes a number of factors related to children's susceptibility to diarrheal disease and associated death. These range from the acquisition of susceptibility-related micronutrients (zinc, Vitamin A) to effective treatment (for example, oral rehydration therapy, ORT). These are covered in more detail below and are selected based on the strength of evidence and inclusion in other diarrheal control frameworks. For some of these implicated susceptibility risk factors, the evidence is inconclusive as to whether or to what extent the factor affects the risk of infection given a level of exposure, the severity of illness, or the probability of mortality given infection. As a result, these factors are included as a combined Susceptibility Index (SusIndexi), which is designed to be proportional to the excess risk associated with all of the factors.

$$\text{SusIndex}_i = \prod_k \sum_{i,j} (RR_{j,k} \cdot RiskFactor_{i,j,k})$$

Where $RR_{j,k}$ is the relative risk associated with the jth level of risk factor k, $RiskFactor_{i,j,k}$ is the level of that risk factor for individual i. For some risk factors (for example, zinc supplementation and vitamin A supplementation) there are only two levels (yes or no) and $RiskFactor_{i,j,k}$ serves as a dummy variable. For other risk factors, the levels are continuous.

Undernutrition

A number of studies have found associations between nutritional status and death due to diarrheal disease. There is an increasing understanding that undernutrition and diarrhea are connected in a cyclic feedback loop. In the context of this susceptibility index, the WASH PRM focuses on how undernutrition increases the likelihood of mortality from diarrhea. Additional effects of undernutrition on the risk of infection are not modeled. Caulfield et al. (2004) and Black et al. (2008) estimate the relative risk of cause-specific mortality (including diarrhea) for different levels of stunting (low height for age), wasting (low weight for height), and underweight (weight for age). Relative risks are estimated based on z-scores, with estimates for different levels (–1 to –2 SD, –2 to –3 SD, and less than –3 SD) compared with normal (greater than –1 SD). For the WASH PRM, estimates are used for low weight for age on diarrheal mortality as a likely measure of long- and short-term undernutrition effects. RRs are reported for each level to estimate a piecewise linear risk function that provides a continuous estimate of excess risk as WFA z-scores decline.

Zinc Supplementation

Imdad et al. (2011) carried out a metaanalysis of the effect of zinc supplementation on diarrheal incidence and associated mortality. They found a significant reduction in incidence (RR=0.87; CI: 0.81, 0.94) and a nonsignificant reduction in mortality (RR=0.82, ns).

A 13 percent reduction is used in the estimates here. They found that this effect varied and was greatest in areas with zinc deficiency. Currently, this heterogeneity of effect is not accounted for in the PRM model. Other metaanalyses have examined the effects of therapeutic zinc treatment on diarrhea severity. Lamberti et al. (2013) observe a 26 percent reduction in the risk of diarrhea lasting more than three days (RR=0.74; CI:0.68-0.80). However, there are no conclusive studies on the effects of zinc treatment on diarrhea mortality when controlling for ORT use. Therefore, this effect is not included.

Oral Rehydration Treatment (ORT)

There is substantial evidence of the effect of ORT on the severity and duration of diarrhea. Based on 157 studies, Munos, Walker, and Black (2010) estimated a 93 percent reduction in mortality due to diarrhea with the use of ORT (packet and home remedy). This includes three studies reporting reduction in mortality and 153 reporting failure of treatment. The 93 percent reduction is based on modeling full coverage based on 69 percent reduction in the studies with a pooled coverage of 74 percent.

For ORT, data are available only for children who have had a diarrheal episode in the previous two weeks. If analyses were restricted to these observations, the coverage of analyses would become very sparse, and there would be a likely bias or underestimation of the occurrence of diarrhea. As a result, rather than including whether a child received ORT for a recent diarrheal episode, WASH PRM estimates the propensity for receiving ORT given the household's wealth quintile, maternal education, region, and child age. Values for children without a recent episode are imputed using a logistic regression model built on data from children who did have an episode. This offers a more widespread estimate of the likelihood of receiving ORT.

Vitamin A

Imdad et al. (2011) examined the effect of vitamin A supplementation on diarrhea-specific mortality, as well as outcomes related to pneumonia and measles. Based on 12 studies with data on diarrhea-specific mortality, they estimated a pooled effect of 30 percent reduction due to vitamin A supplementation (RR=0.70; CI: 0.58-0.86) among children 6–59 months of age. This estimate is incorporated in the WASH PRM model. An earlier metaanalysis found no effect of supplementation on the incidence of diarrhea (Grotto et al. 2003).

Other Susceptibility Risk Factors

Other risk factors that are associated with decreasing susceptibility to diarrhea that are not included in the WASH PRM model are exclusive breastfeeding, measles vaccination, and rotavirus vaccination. The reasons for omitting these susceptibility risk factors in the WASH PRM model include difficulty in assessing the alleviation of risk associated with these factors in relation to WASH.

Combined Risk Index

Susceptibility and exposure risks are combined in a risk index:

$$RiskIndex_i = ExpIndex_i \cdot SusIndex_i$$

Quantifying the Disease Burden

The model provides a relative measure of the risk of diarrheal morbidity and mortality that can be compared across economic and geographic subpopulations. However, it does not provide an absolute measure of disease burden. This is done by combining risk model estimates with national burden estimates from the Global Burden of Disease (GBD) project. These provide the overall envelope for diarrheal morbidity and mortality (as events and disability adjusted life years, DALYs), and the risk model provides an estimate of the distribution across the population.

This can be expressed as:

$$Burden_i = DALYBurden \cdot \frac{RiskIndex_i}{\overline{RiskIndex_i}}$$

where $Burden_i$ is the individual burden for individual i, DALYBurden in the average population burden (from GBD), $RiskIndex_i$ is the Risk Index above for individual i, and $\overline{RiskIndex_i}$ is the corresponding mean risk.

References

Black, R. E., L. H. Allen, Z. A. Bhutta, L. E. Caulfield, M. de Onis, M. Ezzati, C. Mathers, and J. Rivera. 2008. "Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences." *The Lancet* 371 (9608): 243–60.

Cairncross, S., and V. Valdmanis. 2006. "Water Supply, Sanitation, and Hygiene Promotion." In *Disease Control Priorities in Developing Countries [Internet]*, 2nd ed., edited by D. T. Jamison, J. G. Breman, A. R. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills, and P. Musgrove, chapter 41. Washington, DC: World Bank. http://www.ncbi.nlm.nih.gov/books/NBK11755/.

Caulfield, L. E., M. de Onis, M. Blössner, and R. E. Black. 2004. "Undernutrition as an Underlying Cause of Child Deaths Associated with Diarrhea, Pneumonia, Malaria, and Measles." *The American Journal of Clinical Nutrition* 80 (1): 193–98.

Clasen, T., A. Prüss-Ustun, C. D. Mathers, O. Cumming, S. Cairncross, and J. M. Colford. 2014. "Estimating the Impact of Unsafe Water, Sanitation and Hygiene on the Global Burden of Disease: Evolving and Alternative Methods." *Tropical Medicine and International Health* 19 (8): 884–93.

Fewtrell, L., R. B. Kaufmann, D. Kay, W. Enanoria, L. Haller, and J. M. Colford. 2005. "Water, Sanitation, and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: A Systematic Review and Meta-Analysis." *Lancet Infectious Diseases* 5 (1): 42–52.

Grotto, I., M. Mimouni, M. Gdalevich, and D. Mimouni. 2003. "Vitamin A Supplementation and Childhood Morbidity from Diarrhea and Respiratory Infections: A Meta-Analysis." *The Journal of Pediatrics* 142 (3): 297–304.

Imdad, A., M. Y. Yakoob, C. Sudfeld, B. A. Haider, R. E. Black, and Z. A. Bhutta. 2011. "Impact of Vitamin A Supplementation on Infant and Childhood Mortality." *BMC Public Health* 11 (Suppl. 3): S20.

Lamberti, L. M., C. L. F. Walker, K. Y. Chan, W-Y. Jian, and R. E. Black. 2013. "Oral Zinc Supplementation for the Treatment of Acute Diarrhea in Children: A Systematic Review and Meta-Analysis." *Nutrients* 5 (11): 4715–40.

Lim, S. S., T. Vos, A. D. Flaxman, G. Danaei, K. Shibuya, H. Adair-Rohani, et al. 2012. "A Comparative Risk Assessment of Burden of Disease and Injury Attributable to 67 Risk Factors and Risk Factor Clusters in 21 Regions, 1990–2010: A Systematic Analysis for the Global Burden of Disease Study 2010." *The Lancet* 380 (9859): 2224–60.

Munos, M. K., C. L. F. Walker, and R. E. Black. 2010. "The Effect of Oral Rehydration Solution and Recommended Home Fluids on Diarrhoea Mortality." *International Journal of Epidemiology* 39 (Suppl 1): i75–87.

Patil, S. R., B. F. Arnold, A. L. Salvatore, B. Briceno, S. Ganguly, J. M. C. Jr, and P. J. Gertler. 2014. "The Effect of India's Total Sanitation Campaign on Defecation Behaviors and Child Health in Rural Madhya Pradesh: A Cluster Randomized Controlled Trial." *PLOS Med* 11 (8): e1001709.

Pickering, A. J., H. Djebbari, C. Lopez, M. Coulibaly, and M. L. Alzua. 2015. "Effect of a Community-Led Sanitation Intervention on Child Diarrhoea and Child Growth in Rural Mali: A Cluster-Randomised Controlled Trial." *The Lancet Global Health* 3 (11): e701–11.

Prüss, A., D. Kay, L. Fewtrell, and J. Bartram. 2002. "Estimating the Burden of Disease from Water, Sanitation, and Hygiene at a Global Level." *Environmental Health Perspectives* 110 (5): 537–42.

Prüss-Ustün, A., J. Bartram, T. Clasen, J. M. Colford, O. Cumming, V. Curtis, S. Bonjour, A. D. Dangour, J. De France, L. Fewtrell, M. C. Freeman, B. Gordon, P. R. Hunter, R. B. Johnston, C. Mathers, D. Mäusezahl, K. Medlicott, M. Neira, M. Stocks, J. Wolf, and S. Cairncross. 2014. "Burden of Disease from Inadequate Water, Sanitation and Hygiene in Low- and Middle-Income Settings: A Retrospective Analysis of Data from 145 Countries." *Tropical Medicine and International Health* 19 (8): 894–905.

Rheingans, R., J. Anderson, K. Bagamian, S. Ryan, J. Watson, and O. Cumming. 2017. "WASH Poverty Diagnostic Poverty Risk Model Methods Note." Background Paper. World Bank, Washington, DC.

Schmidt, W-P, and S. Cairncross. 2009. "Household Water Treatment in Poor Populations: Is There Enough Evidence for Scaling up Now?" *Environmental Science and Technology* 43 (4): 986–92.

Wolf, J., A. Prüss-Ustün, O. Cumming, J. Bartram, S. Bonjour, S. Cairncross, et al. 2014. "Systematic Review: Assessing the Impact of Drinking Water and Sanitation on Diarrhoeal Disease in Low- and Middle-Income Settings: Systematic Review and Meta-Regression." *Tropical Medicine & International Health*. 19 (8): 928-42.

WHO/UNICEF JMP (Joint Monitoring Programme). 2015. "Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment." JMP, WHO and UNICEF, Geneva.

Appendix C
Service Delivery Problems Identified by Selected WASH Poverty Diagnostics

Table C.1: WASH Services and Delivery Problems in Nine Countries

Country	WASH Service analyzed	Service delivery problem(s)
Bangladesh	Urban water and sanitation	Low levels of safe and sustainable access to water, sanitation, and hygiene services. Inequities in WASH access hinder strategies to promote shared prosperity.
Ethiopia	Rural water	Persistent concerns about the level of service rural water users actually receive in terms of water quantity, quality, reliability, and accessibility. Access to rural water services varies by region and subregion.
Guatemala	Rural water and sanitation	More than 50 percent of the rural population lack access to improved sanitation and 20 percent lack access to an improved water supply.
Indonesia	Urban water	Urban water utilities are unable to extend services to those without access and provide quality services to those that already have access.
Mozambique	Rural water	Persistently low levels of improved water supply coverage exacerbated by geographical and income-based inequities. Poor maintenance of existing infrastructure with high rates of non-functionality and poor service outcomes.
Niger	Rural sanitation	Extremely low access rate and a negative trend, with open defecation increasing among the poor.
Nigeria	Urban and rural water	Access to piped water through household connections has decreased in urban areas leading to self-supply. High post-construction failure rates of water points.
Panama	Rural water and sanitation	Water and sanitation quality is substantially worse in the rural areas, and more specifically in indigenous communities
Tanzania	Rural water	Failure to maintain existing and newly constructed water points.

Appendix D
Service Characteristics

This appendix provides two illustrative examples of how service characteristics affect the political salience of community sanitation and networked water.[1] Table D.1 summarizes the typical differences between the two services.

Nature of Good

The nature of a good or service is determined by rivalry and excludability. A public good is both nonrival and nonexcludable; a private good is both rival and excludable. Public goods result in market failures or market underprovision, and thus require public intervention. Piped water supply is a private good, while community sanitation is a public good.

A good is **rival** if one person's use precludes another person from using it. Community sanitation is not particularly rivalrous. Networked water, however, has high rivalry in terms of access. Rivalry tends to lead to competition and variability of treatment, resulting in low client power and therefore lower political salience.

A good is **excludable** if an individual can be prevented from accessing its benefits. This is also known as *targetability*. Community sanitation has low excludability, whereas there is a higher

Table D.1: Service Characteristics of Community Sanitation and Networked Water

Characteristics		Community sanitation	Networked water
Nature of good	Rivalry	Low	High
	Excludability and targeting	Low	High
Market failure	Monopoly tendency	Low: State and household provision	High: State monopoly with market alternatives
	Positive and negative externalities	High	High
	Information asymmetry	Medium	Medium
Task	Measurability and visibility of outputs	Low	High
	Discretion of staff	Low	Medium
	Transaction intensity	Medium	Low
	Provider autonomy	Low	Medium
Demand	Frequency and predictability	High	High
	Territoriality	High	High
Political salience		Medium-low	High

Source: Adapted from Batley and Mcloughlin 2015: 281, table 3.

possibility of excluding users from a networked water system and targeting water services to particular individuals or groups. Political salience increases with excludability because it allows for the targeting of goods and services to certain constituents or clients—a useful tool to those seeking to garner political support.

Market Failure

Market failure characteristics provide the rationale for state intervention.

Community sanitation has a low **monopoly tendency**, as the state and households tend to provide these services. Networked water has a strong tendency toward monopoly because the potential for scale economies and the large capital requirements often result in the dominance of a single utility. This leads to public provision and/or the need for economic regulation. Left unchecked, a monopoly tendency restricts the power of the clients by constraining their ability to "exit" from the service by choosing an alternative, and thereby reduces political salience.

Positive and negative externalities result in under- and overprovision in the market respectively, as private players often do not see themselves as directly benefiting from social gains or being harmed by social losses. Community sanitation has large externalities related to public health that can only be internalized if the entire community becomes free of open defecation. Networked water also has high externalities related to the public health benefits of getting people connected to a safe, improved source of drinking water.

Information asymmetries arise when users are limited in their ability to assess the quality of a good or service, constraining their ability to hold providers to account. Community sanitation faces medium-level information asymmetries because while individuals are aware of the service they are getting, there is also limited information about the services to which they are entitled. Information asymmetries are often high with regards to the quality of networked water, as contaminants often lack any discernable taste or smell, resulting in a need for strong regulation. However, information asymmetries are relatively low with regards to the quantity of networked water (hence the overall score of medium). Where information asymmetries are strong, citizens' voices become weaker and policy makers can less clearly attribute the outcomes to their intervention, resulting in low political salience.

Task

Task-related characteristics influence the ability of users and the state to control and hold providers to account.

Measurement and visibility of processes and outputs affect their *attributability*. Community sanitation is difficult to measure and has low visibility. Building new networked water pipes is a highly visible activity, resulting in its political salience and prioritization among many governments seeking to claim credit. O&M of existing infrastructure is less visible, often resulting in its neglect. Service providers can less easily attribute an outcome to their efforts if that outcome is harder to measure and observe, and therefore they have fewer incentives to provide that service, reducing its salience.

Discretion of staff increases the difficulty of controlling frontline workers, particularly in their daily interactions with users. Community sanitation has low discretion, as tasks are easy to specify in advance. Discretion is theoretically low for networked water as the service tends to be standardized. However, in practice there may be scope for corruption in meter reading and for varying the quality of service, for example, through rationing, and thus overall there is a medium level of discretion. Where discretion is low, policy makers can exercise more control over the frontline provider, strengthening the compact and leading to higher political salience.

Networked water supplies provided by a single utility are usually characterized by low **transaction intensity**, as there is minimal interaction between users and the utility. However, customer interaction may be useful for billing and collection. Depending on the particular scheme, community sanitation may result in more or fewer transactions between providers and users. Tasks that are more transaction intensive are more difficult to standardize and control, reducing their political salience.

Provider autonomy is high for goods and services associated with highly specialized technical knowledge. The degree of specialized knowledge required for community sanitation tasks varies based on the level of service. Networked water engineers have a relatively high degree of provider autonomy. Where provider autonomy is high, policymakers are constrained in their ability to control service providers.

Demand

Demand characteristics affect how users and providers interact with one another.

Demand for sanitation is **frequent and predictable**. Water demand also tends to be predictable and frequent, varying based on seasonality and labor patterns. When a service is both frequent and predictable, individuals live a shared experience, increasing the likelihood of collective action by users and therefore making the service more politically salient.

Territoriality measures the extent to which there is a clear geographic delineation of users of a good or services. Community sanitation has high territoriality, as communities by definition are concentrated in a specific geographic area. Users who are connected to the same networked water supply also tend to be defined by a specific geographic area, resulting in high territoriality. Clear territoriality raises the likelihood of users regularly converging, interacting, mobilizing, and holding providers accountable, thereby strengthening political salience.

Note

1. Based on Batley and Mcloughlin (2015); Mason, Batley, and Harris (2013, 2014a, 2014b).

References

Batley, R., and C. Mcloughlin. 2015. "The Politics of Public Services: A Service Characteristics Approach." *World Development* 74: 275–85.

Mason, N., R. Batley, and D. Harris. 2013. *The Technical is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Drinking Water Services*. United Kingdom: Overseas Development Institute.

———. 2014a. *The Technical is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Sanitation Services*. United Kingdom: Overseas Development Institute.

———. 2014b. *Understanding the Political Implications of Sector Characteristics for the Delivery of Sanitation Services*. London: Overseas Development Institute. http://bit.ly/1dATQQZ.