

Doing More with Less

Smarter Subsidies for Water Supply and Sanitation

Luis A. Andres, Michael Thibert, Camilo Lombana Cordoba,
Alexander V. Danilenko, George Joseph, and Christian Borja-Vega



About the Water Global Practice

Launched in 2014, the World Bank Group's Water Global Practice brings together financing, knowledge, and implementation in one platform. By combining the Bank's global knowledge with country investments, this model generates more firepower for transformational solutions to help countries grow sustainably.

Please visit us at www.worldbank.org/water or follow us on Twitter at @WorldBankWater.

About GWSP

This publication received the support of the Global Water Security & Sanitation Partnership (GWSP). GWSP is a multidonor trust fund administered by the World Bank's Water Global Practice and supported by Australia's Department of Foreign Affairs and Trade; the Bill & Melinda Gates Foundation; The Netherlands' Ministry of Foreign Trade and Development Cooperation; Norway's Ministry of Foreign Affairs; the Rockefeller Foundation; the Swedish International Development Cooperation Agency; Switzerland's State Secretariat for Economic Affairs; the Swiss Agency for Development and Cooperation; Irish Aid; and the U.K. Department for International Development.

Please visit us at www.worldbank.org/gwsp or follow us on Twitter #gwsp.

Doing More with Less

Smarter Subsidies for Water Supply and Sanitation

Luis A. Andres, Michael Thibert, Camilo Lombana Cordoba,
Alexander V. Danilenko, George Joseph, and Christian Borja-Vega

August 2019

© 2019 International Bank for Reconstruction and Development / The World Bank

1818 H Street NW, Washington, DC 20433

Telephone: 202-473-1000; Internet: www.worldbank.org

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Rights and Permissions

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Please cite the work as follows: Andres, Luis A., Michael Thibert, Camilo Lombana Cordoba, Alexander V. Danilenko, George Joseph, and Christian Borja-Vega. 2019. “Doing More with Less: Smarter Subsidies for Water Supply and Sanitation.” World Bank, Washington, DC.

Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2625; e-mail: pubrights@worldbank.org.

Cover design: Bill Praguski, Critical Stages, LLC

Photos:

Cover: Mirva Tuulia Moilanen/World Bank; Bart Verweij/World Bank; Alexander Danilenko/World Bank; Chris Terry/World Bank

Overview left pages: Logga Wiggler/Pixabay; Monica Wise/SOIL; Allison Kwezell/World Bank; Alfribeiro/Getty Images

Overview right pages: World Bank; John Hogg/World Bank; Curt Carnemark/World Bank; World Bank

Chapter 1, World Bank; chapter 2, World Bank; chapter 3, Danilo Pinzon/World Bank; chapter 4, World Bank; chapter 5, World Bank; Appendix A Luis A. Andres/World Bank; Appendix B, Chris Terry/World Bank; Appendix C, Arne Hoel/World Bank; References, Almin Zrno/World Bank

Contents

<i>Acknowledgments</i>	<i>vii</i>
<i>Overview</i>	<i>xi</i>
<i>Abbreviations</i>	<i>xxiii</i>
Chapter 1 Setting the Stage	1
1.1 Water Supply and Sanitation Subsidies: Definition and Rationale	2
1.2 Dominant and Emerging Service Delivery Models	4
1.3 A Classification of Subsidies	6
1.4 How Are Subsidies Funded?	11
Notes	15
Chapter 2 The Challenges of Current Water Supply and Sanitation Subsidies	19
2.1 Subsidies Are Pervasive	19
2.2 Subsidies Are Expensive	22
2.3 Most Subsidies Are Poorly Targeted	31
2.4 Most Subsidies Are Not Transparent	36
2.5 Most Subsidies Are Distortionary	38
Notes	41
Chapter 3 Designing Effective and Efficient Subsidies	45
3.1 Understanding the Context	45
3.2 Defining Policy Objectives	50
3.3 Identifying the Target Service(s) and/or Population(s)	51
3.4 Selecting the Funding Source	62
3.5 Designing the Subsidy	62
Notes	66
Chapter 4 Designing an Effective and Efficient Subsidy Reform Package	69
4.1 Mechanisms to Complement Subsidies	69
4.2 Building Political Coalitions to Support Reform	76

4.3 Communications Strategies for Reform	77
4.4 When to Design a Subsidy Exit Strategy	78
Notes	79
Chapter 5 Key Takeaways	81
Notes	83
References	85
Appendix A Related Background Papers and Case Studies	93
Appendix B Methodology for Estimating the Magnitude of Networked Water and Sanitation Subsidies	97
Appendix C Building Political Coalitions to Support Reform	105
Boxes	
2.1. Increasing Block Tariffs	20
2.2. Why Are Time-Bound Subsidies Rarely That?	23
2.3. Various Ways to Calculate Cost-Recovery Levels	25
2.4. How Do Our Estimates Compare with Other Approaches?	28
2.5. Materiality of Subsidies for the Poor: Networked Water Services in Ten Countries	35
2.6. Subsidies and Resiliency to Economic and Political Shocks: The Case of South Sudan	39
3.1. An Improved Approach to Measuring WSS Affordability	48
3.2. Community-Led Total Sanitation	59
4.1. A Successful Communications Strategy: The Case of Iran	78
Figures	
O.1. Estimating the Magnitude of Subsidies: Two Approaches	xv
1.1. Categorization of Subsidies	9
B2.1.1. Summary of Tariff Structures Implemented, by Utilities in Various Regions	20
B2.2.1. Life Cycle of a Subsidy Regime	23
2.1. Costs of Water and Sanitation Service Provision	24
2.2. Magnitude of WSS Subsidies, by Region	28
2.3. Estimating the Magnitude of Subsidies: Two Approaches	30
2.4. Politically Motivated Allocation of Capital Grants for Infrastructure in Albania	31
2.5. The Percentage of (a) Water and Sanitation Subsidies and (b) Total Economic Expenditure that Accrue to Population Segments, Organized by Wealth Distribution (Decile), in 10 Countries	33

2.6.	Routes of Accountability in Service Provision	40
B3.1.1.	The Access and Affordability of Service: Four Scenarios	49
4.1.	Efficiency Improvements that Help Utilities Reach Financial Viability	73

Tables

0.1.	Economic and O&M Subsidies of Utilities Around the World	xiii
1.1.	Dimensions of Subsidies Intended to Expand Access to Water Supply and Sanitation Services	7
1.2.	Dimensions of Subsidies Intended to Expand Consumption of Water Supply and Sanitation Services	8
1.3.	Transfer Channels	12
2.1.	Economic Subsidies and O&M Subsidies among Utilities	19
B2.3.1.	Alternative Methods for Estimating Cost-Recovery Tariffs	25
2.2.	OPEX and CAPEX Subsidies, by Region (2017 \$ and Average % GDP)	27
2.3.	Water Consumption Subsidies: Errors of Inclusion and Exclusion in 10 Countries	35
2.4.	An Overview of Connection Subsidies	36
3.1.	Pros and Cons of Subsidies for Water vs. Sanitation	52
3.2.	Pros and Cons of Rural vs. Urban Subsidies	54
3.3.	Pros and Cons of Subsidies for Networked/Sewered vs. Nonnetworked/On-Site Services	55
3.4.	Pros and Cons of Access vs. Consumption Subsidies	56
3.5.	Pros and Cons of Subsidizing Infrastructure on Household Premises vs. Off Premises	57
3.6.	Pros and Cons of Supply vs. Demand Subsidies	60
3.7.	Pros and Cons of Subsidies for Capital vs. Operating Expenditures	61
4.1.	Subsidies and Complementary Policy Mechanisms for Improving Access and Consumption	70
4.2.	Characterizing Subsidy Policy Benefits: Basic Framework	76
B.1.	Average Unit Asset Base of 15 Chilean Utilities, Categorized by Size of Customer Base	98
B.2.	Efficient Ratio of Employees to Customers	100
B.3.	Estimated Price Elasticities in Water and Sanitation, by Study and Estimate	102
C.1.	Characterizing Subsidy Policy Benefits: Basic Framework	106

Acknowledgments

This report was prepared by a World Bank team led by Luis Andres (Lead Economist) and comprising Michael Thibert (Consultant), Camilo Lombana Cordoba (Senior Water and Sanitation Specialist), Alexander V. Danilenko (Senior Water and Sanitation Specialist), George Joseph (Senior Economist), and Christian Borja-Vega (Senior Economist), all of the Water Global Practice (GP).

The report draws on background papers, case studies, and additional contributions prepared by the following: MacroConsulting (including Martin Rodriguez Pardina, German Sember, Laura Abramovsky, Julieta Schiro, and Gonzalo Espiñeira), Juan Pablo Cuesta (Consultant), Juan Agustin Echenique (University of Maryland), Emmanuel Garcia (Consultant), Rachel Cardone (Consultant), Rebecca Gilsdorf, (Water and Sanitation Specialist, Water GP), Julio Gonzalez (Consultant), Jonathan Grabinsky Zabludovsky (Consultant), Martin Hall (Communications Officer, Water GP), David Martimortz (Toulouse School of Economics), Massimo Mastruzzi (Senior Governance Specialist, Governance GP), Gabriela Mundaca (Consultant), Shomikho Raha (Senior Public Sector Specialist, Governance GP), Kirstin Conti (Young Professional, Governance GP), Suneira Rana (Consultant), Johan Kruger (Consultant), and Stephane Straub (Toulouse School of Economics).

Incisive and helpful advice and comments were received from Rajesh K. Advani (Senior Infrastructure Specialist, Social, Urban, Rural and Resilience GP), Alexander Bakalian (Lead Water Supply and

Sanitation Specialist, Water GP), Martin Gambrill (Lead Water Supply and Sanitation Specialist, Water GP), William Kingdom (Lead Water Supply and Sanitation Specialist, Water GP), Joel Kolker (Lead Water Supply and Sanitation Specialist, Water GP), Jessica Anne Lopez (Operations Officer, Urban, Rural and Social Development GP), Pier Mantovani (Lead Water Supply and Sanitation Specialist, Water GP), Iain Menzies (Senior Water and Sanitation Specialist, Water GP), Yogita Mumssen (Practice Manager, Water GP), Aude-Sophie Rodella (Senior Economist, Water GP), Rachel Ort (Public Sector Specialist, Governance GP), Steven Schonberger (Director, Water GP), Pilar Maisterra (Manager, Strategy, Risk & Country Community), Maria Vagliasindi (Lead Economist, Energy GP), and Miguel Vargas-Ramirez (Senior Water Supply and Sanitation Specialist, Water GP). The team also received helpful advice from external reviewers: Clarissa Brocklehurst (Water and Sanitation Specialist), David Fuente (University of South Carolina), Doreen Mbalo (GIZ), Tanvi Nagpal (Johns Hopkins University), Regina Rossmann (GIZ), Lesley Pories (Water.org), and Sophie Tremolet (The Nature Conservancy). Alona Daniuk and Isabel Junior provided excellent administrative support, and Fayre Makeig, superb editorial support.

The report has benefited greatly from the strategic guidance and general direction of the management of the Water GP including Guang Chen (former Senior Director), Jennifer Sara (Global Director), Richard Damania (Senior Economic

Advisor), Maria Angelica Sotomayor (Practice Manager), and Marianne Fay (Chief Economist, Sustainable Development Practice Group).

Peer reviewers were Marianne Fay (Chief Economist, GGSCE), Richard Damania (Senior Economic Advisor and Global Lead of the Water, Poverty, and the Economy Global Solution Group, Water GP), Bill Kingdom (Lead Water and Sanitation Specialist, Water GP), Massimo

Mastruzzi (Senior Governance Specialist, Governance GP), and Stephane Straub (Toulouse School of Economics).

This work was made possible by the financial contribution of the Global Water Security & Sanitation Partnership (GWSP), <http://www.worldbank.org/en/programs/global-water-security-sanitation-partnership>.

Doing More with Less

Smarter Subsidies for Water Supply and Sanitation

Water touches every aspect of development and flows through nearly every SDG. Solving many of the largest development challenges requires extending reliable access to safely managed drinking water services to 2.2 billion people, and safely managed sanitation services to 4.2 billion.

Most existing water supply and sanitation subsidies are:



Pervasive

Common across countries, irrespective of region or income level



Expensive

Governments spend around \$320 billion per year (up to 2.40% of regional GDP)



Poorly Targeted

An average of 56% of subsidies are captured by the wealthiest 20% of the population, while a mere 6% are captured by the poorest 20%*



Nontransparent

Facilitate rentseeking by governments and service providers



Distortionary

Contribute to inefficiency, threaten service sustainability, and encourage overexploitation of resources



Yet if well designed, subsidies can be powerful and progressive tools ensuring that all people benefit from water supply and sanitation services.



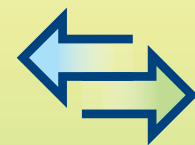
Smart

- The majority of subsidies go to water, urban, and networked services. A better balance across water and sanitation, rural and urban, and different types of service can make subsidies work harder.
- Subsidies can encourage better operational efficiency through performance incentives.
- A single instrument is unlikely to attain all policy goals simultaneously.



Targeted

- Measures to make water supply and sanitation affordable for those in need can ensure that no one gets left behind.
- Effective targeting is increasingly possible through technological innovation.



Implemented Effectively

- A communications strategy is essential to build advance backing and for successful implementation.
- Understanding the institutions, incentives, and interests that shape subsidy reform is vital to cultivating supportive political coalitions.
- When a subsidy is temporary, an appropriate exit strategy must include some form of support for the most vulnerable.
- Complementary policy measures can make scarce public resources go further.



* Percentages from an analysis of 10 developing countries.





Overview

In 2010, the United Nations (UN) declared clean drinking water and sanitation to be human rights. At the time, the UN's Millennium Development Goals focused on halving the number of people living without access to improved water and sanitation services by 2015. Then, in the fall of 2015, the UN adopted the Sustainable Development Goals (SDGs). These raised the global ambition by aiming to “achieve universal and equitable access to safe and affordable drinking water” and to “achieve access to adequate and equitable sanitation and hygiene for all”¹ by 2030.

As of 2015, about 29 percent of the world's population was without safely managed drinking water, and about 61 percent without access to a safely managed sanitation service (WHO and UNICEF 2017). The World Bank estimates that to realize the SDGs by extending safely managed services to these people would cost \$114 billion a year over the period 2015–30 (Hutton and Varughese 2016).²

The water supply and sanitation (WSS) sector remains heavily subsidized around the world, as it has been for decades.³ Despite the prevalence of subsidies and the critical role that effective pricing plays in providers' ability to deliver high-quality services, scant attention has been paid to how current WSS pricing structures and subsidies impede progress toward the SDGs. Although most subsidies are intended to ensure that WSS services are affordable to the poor, they often end up benefiting relatively well-to-do households already connected to networked WSS services. The poorest of the poor, who generally lack access to networked services, are left without their basic human rights to clean drinking water

and sanitation. And, most often, the poorest communities are located in regions and countries with limited capacity for public spending. Given that most subsidies are expensive, poorly targeted, nontransparent, and distortionary, it is urgent that policy makers reconsider how current spending is working, and carefully target available resources to achieve the greatest impact.

In this report, we explore the question of how scarce public resources can be used most effectively to achieve universal delivery of WSS services. To inform our discussion, we analyze subsidies in the sector, including their magnitude, their efficacy in achieving their policy objectives, and the implications of poor design. We then provide guidance to policy makers on how subsidies can be better designed to improve their efficacy and efficiency in attaining their objectives. Finally, we discuss how to design a subsidy reform package that will have the best chances of success.

What Are Subsidies?

Subsidies are a subset of funding flows between governments, service providers, and customers. Subsidies occur when a user/customer pays less for a product or service than the service provider's cost, leaving a third party (e.g., government, other users, future generations) responsible for covering the difference. Subsidies may take the form of explicit financial transfers between two entities (e.g., a utility and a customer) or implicit transfers—such as nonpayment for electricity or deferred maintenance—which occur when products, services, or inputs are underpriced.



Governments subsidize WSS services for a variety of reasons. Two may be highlighted as the most common:

- **Advancing equitable access to affordable WSS services.** Subsidies may be considered desirable if they help poor or marginalized segments of a population attain access to affordable WSS services. They may be used to facilitate access or consumption.
- **Harnessing positive externalities associated with WSS services.** The widely documented societal benefits of WSS services include positive environmental effects and improvements in people's health—in particular, a reduction in infant mortality—and an associated reduction in health-care expenses.

To frame our discussion, we have categorized WSS subsidies using several criteria. First, we consider whether subsidies seek to expand access (e.g., by covering connection charges, initial costs, specific assets, etc.) or ensure that a minimum level of consumption is affordable. We then consider the intended beneficiaries and, if these involve a distinct subset of the population or customer base (e.g., poor households), the targeting mechanism used.

Depending on who ultimately pays for the subsidy—taxpayers, philanthropic organizations, or a particular group of present and/or future users—the mechanism of the transfer between payer and recipient may vary. To a large extent, the choice of funding mechanism will be influenced by the type of service involved, and the technological and institutional setup of the sector. Here, we consider two basic funding mechanisms:

- A **demand-side subsidy** involves a direct transfer from the fund provider to the subsidized user. Generally, the government transfers money

directly to the user, who then uses it to pay the service provider.

- In the case of a **supply-side subsidy**, funds are channeled through the service provider or another third party, which, in theory, passes the funds on to the consumer in the form of lower prices.

Key Messages

Based on an analysis of subsidies around the world, this report puts forward three key messages. First, current WSS subsidies fail to achieve their objectives due to poor design; they tend to be pervasive, expensive, poorly targeted, nontransparent, and distortionary. Second, this poor performance can be avoided; new knowledge and technologies are making it increasingly possible for subsidies to cost less and help more. By moving beyond the design flaws of the past, subsidies are a viable means of ensuring access to sustainable and safely managed WSS services for all. Finally, to successfully reform subsidies, a subsidy reform package, in addition to improved subsidy design, is required. An effective subsidy reform package includes complementary policy measures, the building of a supportive political coalition, a communications strategy, and an exit strategy (where applicable).

Message 1: Current WSS Subsidies Fail to Achieve Their Objectives Due to Poor Design; They Tend to Be Pervasive, Expensive, Poorly Targeted, Nontransparent, and Distortionary.

While subsidies of WSS service provision are generally implemented in pursuit of worthwhile objectives, poor design often undermines these objectives, rendering subsidies pervasive, expensive, poorly targeted, nontransparent, and distortionary. In chapter 2, we present evidence on the



current state of subsidies within the WSS sector and discuss particular design elements that most often prove problematic.

Subsidies Are Pervasive

Subsidies are prevalent across countries, irrespective of region or income level. Table O.1 shows the prevalence of economic subsidies⁴ and operation and maintenance (O&M) subsidies among the utilities included in the World Bank's International Benchmarking Network for Water and Sanitation Utilities (IBNET) database. Only 14 percent of the utilities listed in the IBNET database generate enough revenue to cover the total economic costs of service provision, while only 35 percent of the utilities are able to cover, at a minimum, the O&M costs of service provision.

Such pervasiveness is due not only to the necessity of clean drinking water and adequate sanitation for health and well-being, but also to the nature of networked WSS services. The construction of new infrastructure, the expansion or improvement of service to households, and the reduction of tariffs are highly visible to citizens. In many cases, public officials use subsidies to manage political support. Even where subsidies do not reach their intended beneficiaries, they often become entrenched owing to the interests of the stakeholders who do benefit from them. Reformers may find it difficult to reduce existing

subsidies or even to alter their design. And so, in many cases, the level—and longevity—of a subsidy may be influenced by politicians' unwillingness to charge consumers for the services they enjoy or to disrupt the status quo.

The characteristics of networked WSS services make setting cost-reflective pricing difficult and allow utilities to neglect asset maintenance, which in most cases they can do without affecting short-term service delivery. This leads to significant subsidization, which must be funded down the road to avoid service disruptions. Declining marginal costs due to large fixed costs make efficient pricing using marginal costs difficult, and such pricing would not allow for full cost recovery anyway (since the marginal cost of service provision is lower than the average cost). Networked services' high proportion of shared costs gives their providers a large degree of discretion in setting pricing structures, which is often exploited to advance political agendas. Around 65 percent of the cost of supplying piped water, and 80 percent of the cost of sewerage systems, is for long-lived capital assets (which are likely to last 20–40 years in the case of water, and 40–60 years for sewerage) (Komives et al. 2005). This means that in the short to medium term, utilities may be able to function with a pricing structure that does not cover the full costs of capital and neglects the maintenance of assets—a common occurrence in political environments where subsidies take the place of full cost recovery.

TABLE O.1. Economic and O&M Subsidies of Utilities Around the World

	Number of utilities	%		Number of utilities	%
No economic subsidy	220	14	No O&M subsidy	544	35
Economic subsidy	1,329	86	O&M subsidy	1,005	65
Total	1,549	100	Total	1,549	100

Source: Authors' calculations based on IBNET data, which cover utilities in 147 countries.

Note: IBNET = International Benchmarking Network for Water and Sanitation Utilities; O&M = operation and maintenance.



Subsidies Are Expensive

Since subsidies are the difference between the cost of service provision and the amount paid by users, defining and estimating the costs of WSS services is fundamental to any analysis. When computing the costs of service, total economic costs (and, eventually, inefficiencies, or slack) should be taken into account. These include operation and maintenance costs, depreciation, taxes, a fair and reasonable return on capital, and environmental costs.

The cost of subsidies associated with the operations, maintenance, and major repair and replacement of existing WSS infrastructure in much of the world (excluding, notably, China and India) is an estimated \$289–\$353 billion per year, or 0.46–0.56 percent of these countries' combined gross domestic product (GDP).⁵ This figure rises, shockingly, up to 1.59–1.95 percent if only low- and middle-income economies are considered, an amount largely due to the capital subsidies captured in our estimation. Subsidies of operating costs account for approximately 22 percent of the total subsidy amount both in the full sample and for low-income economies separately. At \$101–\$124 billion per year, the region of Latin America and the Caribbean has the largest amount of subsidies (including both operating and capital subsidies), in absolute terms and as a percentage of GDP. Annual subsidy amounts by region range from 0.05 percent to 2.40 percent of GDP, and low-income economies are generally at the high end of this range. It is important to note that our estimation does not include either capital expenditure for infrastructure expansion—which tends to be fully subsidized—or environmental costs. Therefore, the actual global magnitude of networked water and sanitation subsidies is much greater than our estimation.⁶

While our estimates of subsidies for operating expenditure are relatively straightforward—they predominantly represent explicit expenditures required to sustain service provision at current levels of efficiency and quality—our estimates of subsidies for capital expenditure (CAPEX) require additional nuance. Because of a lack of data on most countries' direct expenditure on networked WSS services, our model instead estimates the CAPEX required for the replacement of existing infrastructure. However, there have been several recent attempts to extrapolate direct expenditure from countries with more comprehensive and transparent expenditure data to regional, and even global, levels of expenditure.

Prior estimations of global and regional direct CAPEX for WSS services in low- and middle-income countries, making use of data available from a limited number of countries, are between 0.4 and 0.5 percent of GDP. When combined with our model estimates for OPEX, the use of the limited direct CAPEX data available results in total networked water and sewerage sanitation subsidies in low- and middle-income countries in the range of 0.75–0.95 percent of GDP. While these estimates are below our estimate of 1.59–1.95 percent of GDP (also for low- and middle-income countries), such discrepancy is not unexpected given key differences between the two approaches followed.

First, the use of direct expenditure significantly underestimates the CAPEX subsidies provided to the sector for existing infrastructure due to the deferral of maintenance—a phenomenon especially common in low- and middle-income countries. Second, while our model accounts for the full costs of required major repairs and replacement of existing infrastructure, it does not account for expenditures toward infrastructure expansion. In a steady-state situation whereby



infrastructure expansion is limited, both estimates should be reasonably similar since actual direct CAPEX would be exclusively—and comprehensively—covering the maintenance and replacement of existing infrastructure. The two key differences between these two approaches to subsidy estimation are depicted in figure O.1.

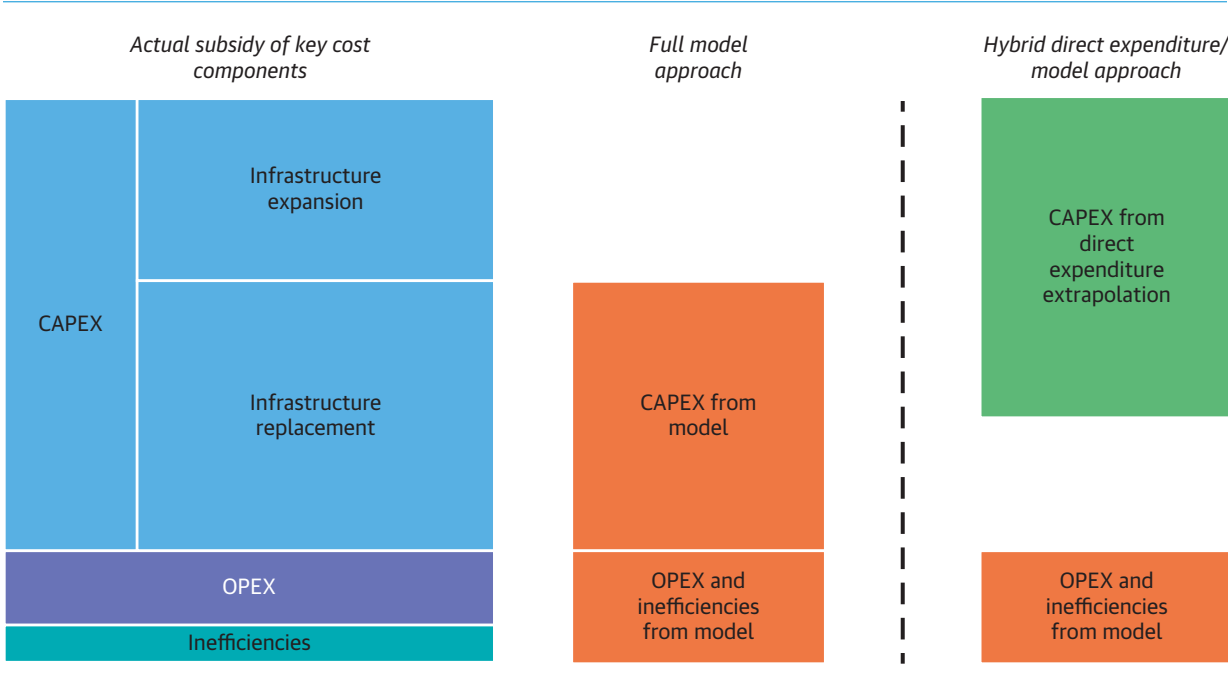
Most Subsidies Are Poorly Targeted

In the 10 countries we analyzed, an average of 56 percent of subsidies reach the wealthiest quintile of the population, while a mere 6 percent reach the poorest quintile.² Subsidies designed to ensure a minimum level of water consumption among poor households

rarely achieve this goal, but instead tend to disproportionately benefit the wealthy. Across the countries we analyzed, consumption subsidies are regressive, with the wealthiest households capturing the lion’s share. In fact, each decile of household income captures a larger share of the total subsidy amount than the poorer decile below it.

An analysis of how well subsidies target their intended beneficiaries in 10 countries suggests that poor performance does not arise primarily from subsidy design, but from two factors related to access. First, most WSS subsidies focus on networked services, even though the poorest communities are typically in areas not serviced by networks.

FIGURE O.1. Estimating the Magnitude of Subsidies: Two Approaches



Source: Authors’ compilation.
 Note: CAPEX = capital expenditure; OPEX = operating expenditure. The full model approach estimates CAPEX, OPEX, and inefficiencies using our model, which complements utility-specific data with estimates of the long-term incremental costs of efficient model utilities. The hybrid direct expenditure/ model approach, meanwhile, substitutes direct expenditure data in the place of the CAPEX model estimates, while maintaining the model’s estimates for OPEX and inefficiencies.



Second, even where poor households *could* connect to a network, many do not do so because they cannot afford the connection and/or consumption charges. The result is that many rich households are included in the subsidy recipient pool, while even more poor households are excluded. This issue is particularly pronounced in the five African countries analyzed, where errors of inclusion and exclusion fall between 90 and 100 percent (with Nigeria's error of inclusion being somewhat lower).⁸

Most Subsidies Are Not Transparent

Many common approaches to subsidizing the WSS sector lack transparency; this allows some service providers to misuse scarce public resources, failing to benefit customers through improved service quality and/or reduced costs. A particularly opaque method of subsidization is general financial support to the service provider (through transfers to cover operational expenditures, direct funding of capital assets, tax exemptions, subsidized prices for inputs, loan guarantees, and so on). Ideally, a government entity provides a subsidy with the intention that the service provider will pass it on to consumers in the form of improved services at lower costs. But since the service provider is responsible for allocating the subsidy, much of the financial support may be captured by the provider's management and employees instead of going toward the maintenance required to sustain or improve the level of service. The customers, meanwhile, may scarcely benefit from the subsidy, whether in the form of improved service quality or reduced costs, and may even observe a deterioration in service quality as maintenance is neglected. And since a utility possesses more information about its cost structure and level of efficiency than any regulator, the lack of transparency is difficult to

overcome. This so-called informational asymmetry gives the utility a bargaining advantage that can lead to inadequate and inefficient services, inflated costs, or both.

Information asymmetries also exist in contexts where several levels of government oversee the WSS sector, as is common in most countries. For example, local needs are difficult for central authorities to observe and estimate, and this may result in suboptimal levels of investment. Also, administrative complexity can provide cover for rent-seeking. For example, central authorities may deliberately foster opacity in intergovernmental allocations and the timing of transfers, in some cases influenced by patronage politics at the local level.

Most Subsidies Are Distortionary

Poorly designed subsidies contribute to inefficiency, and may even threaten the sustainability of service. Utilities may find themselves trapped in a vicious circle whereby low prices lead to revenue losses and required maintenance is postponed, leading to mounting losses. The maintenance needs of underground piped networks in particular are difficult to observe and monitor, and underinvestment in their maintenance is common. Inadequate maintenance shortens the life span of assets, reduces service quality and coverage, and contributes to financial losses.

Subsidized tariffs do not reflect the true cost of a service and therefore cannot provide signals that might encourage efficient production or consumption. By affecting prices, subsidies distort economic agents' choices. On the supply side, subsidies may discourage utilities from increasing their efficiency by improving collection rates and billing accuracy, for example, or by reducing water losses. With a significant amount of funding coming from government



transfers, utilities are less likely to hold themselves accountable to consumers, reducing their incentives to improve service quality. On the demand side, subsidized prices may discourage consumers from seeking more efficient providers or encourage over-consumption in a context where cost-reflective prices would encourage conservation.

Message 2: The Current Poor Performance of WSS Subsidies Can Be Avoided; New Knowledge and Technologies Are Making it Increasingly Possible for Subsidies to Cost Less and Do More.

Although current WSS subsidies tend to be pervasive, expensive, nontransparent, distortionary, and poorly targeted, such poor outcomes are not a given. Well-designed subsidies are indeed an important and necessary policy instrument for decision makers, who can use them to effectively and efficiently attain their objectives and avoid the adverse impacts of the past. In chapter 3, we provide guidance to policy makers on improving the efficacy and efficiency of WSS subsidies.

Improving the efficacy and efficiency of subsidies requires careful consideration of five key questions:

1. *What is the context?*
2. *What are the policy objectives that the subsidy seeks to achieve?*
3. *What are the target service(s) and/or population(s)?*
4. *How will the subsidy be funded?*
5. *What subsidy design will be most effective and efficient?*

Since socioeconomic factors, WSS service delivery modalities, levels of institutional capacity, and fiscal space vary substantially from context to context, we do not seek to provide explicit recommendations on what should be subsidized and how. Instead, we

discuss the myriad factors and policy options that should be considered along the way, therefore providing a roadmap for policy makers to follow in assessing their particular context and determining the most effective and efficient subsidy design.

What Is the Context?

Policy makers should first seek to understand how effective and efficient existing subsidies are at attaining their underlying goals to make informed decisions on how they should be reformed. In particular, they need to understand the magnitude of public resources being expended, the ultimate beneficiaries of those resources, the public's perception of the subsidy and any opportunities for misappropriation, and the subsidy's adverse impacts on sector performance and resource allocation. Using this information, policy makers can then improve subsidy design to avoid existing pitfalls.

Subsequently, a political economy lens should be used to assess the sector's institutional and financial structure, the reasons behind an unsatisfactory status quo (where applicable), and opportunities to improve and propel subsidy reform. Efforts to reform subsidies have had widely varied results across countries, with successes often predicated on reformers' ability to understand and strategically overcome political barriers. An assessment of (i) the WSS sector's institutional structure and (ii) how subsidies are currently organized allows for a better understanding of the prospects for reform. Where a subsidy is failing to achieve its intended objectives, a political economy analysis can determine the key institutional and policy-related bottlenecks that explain its poor performance. Finally, attention can be turned to the future: identifying opportunities for reform and developing strategies to overcome institutional and policy-related bottlenecks.



Finally, an up-front understanding of affordability barriers to WSS service provision is imperative to the subsidy design process. The number of households that cannot afford to access WSS services, their relative socioeconomic characteristics and geographic locations, and the gap between what each household can reasonably be expected to pay and the total cost of service, in addition to any liquidity barriers, are all crucial data needed to answer four key questions:

1. *Is a subsidy required to advance equitable access to affordable WSS services?*
2. *What service and/or population should be targeted?*
3. *What is the magnitude of the subsidy required?* (The answer will help decide available funding options.)
4. *Which subsidy design options would be most effective and efficient?*

A comprehensive analysis of affordability provides the policy maker with important insights into which populations require support, and whether one-time access costs or recurrent consumption charges pose the greatest challenge to affordability.

What Are the Policy Objectives?

The specific policy objectives that a prospective subsidy seeks to attain largely dictate its design. As discussed above, the most common policy objectives that WSS subsidies seek to attain are:

- Advancing equitable access to affordable WSS services
- Harnessing positive externalities associated with WSS services

A single policy instrument—no matter how ingeniously designed—is unlikely to meet all policy objectives simultaneously. In most cases, a subsidy's

target population or service will differ depending upon which objective is selected. Subsidies to advance equitable access to affordable WSS services seek to either reduce the cost of service to end users (i.e., ensure a minimum level of consumption) or expand service areas to unserved populations (i.e., expand access). Meanwhile, the pursuit of positive externalities will lead to the prioritization of densely populated areas and sanitation services that have increased potential to positively impact the environment and/or improve public health.

What Are the Targeted Service(s) and/or Population(s)?

Upon selecting a policy objective, policy makers must decide which service(s) and/or population(s) will be targeted. As with policies in general, there is no *one-size-fits-all* solution to the problems of inadequate access to or consumption of WSS services: the most suitable policy will depend on the specific goals to be attained, the context in which it is to be implemented, and the resource constraints of the government and stakeholders.

Any decision to subsidize a particular service, population, or cost in the WSS sector entails inherent trade-offs that affect the efficient attainment of the chosen objectives. Although subsidies with a policy objective to advance equitable access to affordable WSS services will, by definition, seek to benefit the poor and marginalized, the decision to target, for example, a particular service (e.g., networked) or geographic areas (e.g., urban) will establish the eligibility of particular segments of the population, even before any selection of a targeting mechanism. In this report, we provide an overview of trade-offs associated with subsidizing: (i) water vs. sanitation,



(ii) urban vs. rural areas, (iii) networked/sewered vs. nonnetworked/on-site services, (iv) infrastructure on household premises vs. off, (v) supply vs. demand, (vi) capital vs. operating expenses, and (vii) access vs. consumption. Though these trade-offs are neatly categorized to aid the process of analysis, it should be noted that there is considerable overlap among them, and their relevance will depend on the specifics of the case at hand.

How Will the Subsidy Be Funded?

WSS subsidies can be funded by either taxpayers (through government) or philanthropic funds, or through cross-subsidization by charging other present and/or future users more than the cost of service (which can include users of an unrelated service subsidizing users of WSS services). The choice of funding will largely be driven by the government's fiscal space, opportunities for philanthropic funding or concessional financing, and the potential for cross-subsidization across users.

Each type of funding source (government, other users, or third parties) carries its own risks. Governments may fail to deliver the promised resources. This risk is borne by the customer in the case of demand-side subsidies, or by the utility in the case of supplier-side subsidies. Also, in many cases, subsidies are part of the national budget and therefore must be approved on an annual basis, implying a continuity risk for the funding of long-lived sunk assets. When the subsidy is financed by underpricing an input generated by other sectors, this risk is also present, since the subsidy depends on a government policy that can be changed or reversed. In the case of cross-subsidies, cost recovery requires an estimation of user charges across the customer base to ensure a proper balance between subsidy recipients and

cross-subsidizers. The difficulty in conducting this estimation introduces the risk that the subsidy amount may exceed the revenue collected from the cross-subsidizers, thus entailing a deficit.

What Design Will Be most Effective in the Context?

After selecting the policy objective, the target service(s) and/or population(s), and the means of funding, policy makers can turn their attention to the design of the subsidy itself. As they do so, it is important to keep in mind the characteristics of well-designed subsidies: they should be well targeted, transparent, and nondistortionary.

Our goal is not to present a comprehensive catalogue of subsidy design options. Instead, we highlight three key strategies that have been proven, when well designed and implemented, to improve the efficacy and efficiency of subsidies: (i) the use of alternative approaches to improve targeting, (ii) making subsidies conditional on performance, and (iii) decoupling subsidies from service charges.

Common methods of targeting WSS subsidies have generally been ineffective at directing scarce public resources toward their intended beneficiaries—the poor. Yet there are three main approaches that may be used to better target WSS subsidies to the poor. First, policy makers can subsidize poor households' connection/access to WSS services in contexts where connection rates are low, where the poor in particular lack WSS household connections, and where sufficient infrastructure exists to service their neighborhoods. Second, they can better identify poor households requiring consumption subsidies through administrative selection, either using means-testing or readily observable factors strongly correlated with poverty (e.g., location). Third, they



can provide a range of types of WSS services that are most likely to reach everyone. The appropriate policy mix of these three pro-poor instruments will depend on local conditions. We should stress that although some improved targeting mechanisms may entail additional administrative costs, these can be significantly reduced through the use of innovative technology or cost sharing with other government programs.

The conditioning of subsidies on well-crafted performance targets that are tangible, transparent, verifiable, and under the service provider's control can avoid inefficiencies associated with traditional supply-side subsidies. Performance- and results-based contracts can be used in both public-public or public-private contracts to improve performance by linking subsidies not to individual expenditures, but rather to the timely and quality delivery of verifiable outputs or results (Mumssen et al. 2018). Key performance indicators, developed by the government or regulator, may include standards for service continuity and water pressure; nonrevenue water reduction; meter installation or service repair schedules; the volume of waste treated or reused; or for addressing consumer complaints.

The decoupling of subsidies from WSS access and consumption charges through the provision of cash transfers, whether conditional or unconditional, has the potential to improve the efficiency, transparency, and targeting of WSS subsidies. By avoiding the use of the service provider as an intermediary, cash transfers avoid the distortionary impacts on service providers previously discussed. The service provider remains accountable to meeting the needs of the customer, since it cannot depend upon direct transfers from the government to make up any funding

gaps. Furthermore, by decoupling subsidies from the service itself, the targeting of WSS subsidies is improved in contexts where a significant proportion of poor households lack access, since poor households that either live outside the provider's service area or are unable to connect can now benefit from the subsidy.

Message 3: To Successfully Reform Subsidies, a Subsidy Reform Package of Four Complementary Elements (in Addition to Improved Subsidy Design) Is Required.

Subsidies do not function in isolation: any well-designed subsidy requires a number of additional elements to facilitate its acceptance and improve its efficacy in both advancing equitable access to affordable WSS services and harnessing positive externalities. In chapter 4, we provide guidance to policy makers on each of the four crucial elements of an effective subsidy reform package: complementary policy mechanisms, the building of supportive political coalitions, a communications strategy, and an exit strategy (where applicable).

Complementary Policy Mechanisms

Various policy mechanisms may be used to complement subsidies, with the aim of improving WSS services' access and affordability for the poorest segments of the population. As noted in the World Bank's Utility Turnaround Framework, any sector turnaround should begin with making service providers' current operations and capital investments more efficient (Soppe, Janson, and Piantini 2018), therefore reducing the amount of subsidy required. A number of additional mechanisms can be used to reduce the amount of subsidy required to advance poor households' access to affordable WSS services.



For example, the costs of providing services may be reduced by involving community members in construction and management processes. Innovative technologies and approaches can support service providers in more effectively targeting subsidies to the poor and in overcoming financial, legal, or administrative barriers to access. In some cases where large benefits to particular user groups have become entrenched, the use of social safety nets may be required to ease the burden of lost benefits as subsidies are reformed.

Political Coalitions to Support Reform

To design feasible reforms and implementation plans, it is crucial to develop a strategy to both foster supportive political coalitions and mitigate the impact of opponents. Broad and diffused interests tend not to be well organized, whereas concentrated interest groups can mobilize more readily and effectively to advance their narrower causes. It is therefore important for policy makers to understand how interest groups might support or oppose government efforts toward subsidy reform.² This will depend on the level of organization and political power of the groups concerned, as well as the ability of reformers to choose political allies and to weaken or even win over the political influence of groups that could potentially block a proposed reform's implementation.

A Communications Strategy

Communication is a necessary investment that should be planned and implemented by professionals before, during, and after a reform's implementation. Public reactions to subsidy reform programs are highly contextual and dynamic. Reforms are successful only where an informed and supportive public

understands the rationale for reform. By assessing risks and opportunities early, informing the public in accessible and engaging ways, and helping people understand the benefits of subsidy reform and how these link to their own lives, policy makers can encourage public understanding—and, ultimately, goodwill.

An Exit Strategy (Where Needed)

An exit strategy is an important component of a subsidy reform package when the relevant subsidy is intended to be short term. When proposing a new subsidy, policy makers should consider whether the conditions demanding the subsidy are permanent or likely to dissipate in the near future. If the conditions are temporary in nature, policy makers should develop a credible commitment mechanism that helps the government exit when the time is right. A reform likely to adversely impact the poor or an otherwise politically salient group might be designed in such a way that subsidies are removed gradually, in phases, over time. Some of the reform's phases might include additional elements such as complementary sector or legal reforms, policies to temporarily compensate users for the loss of benefits, and communication strategies, among others. The choice and timing of these elements should be politically informed.

The SDGs for water supply and sanitation set out a transformational vision for the future whose achievement will require substantial financial resources. Given the scarcity of public resources globally, it is more important than ever to ensure that those public resources already allocated to the sector are used efficiently. Well-designed subsidies



effectively advance the goal of equitable access to affordable, sustainable, and quality WSS services, while maximizing the targeting of the poor, promoting transparency, and minimizing distortion. As the financial sustainability of service providers improves, these public resources can be leveraged to attract complementary private resources to the sector. By moving beyond the design flaws of the past, subsidies are a viable means of ensuring access to sustainable and safely managed water supply and sanitation services for all.

Notes

1. The SDGs focus on improving access to “safely managed” water and sanitation services. To fit this definition, improved water services must be accessible on household premises, available as needed, and free of contamination. In the case of sanitation services, this would imply that toilets separate their users from fecal content, which is then disposed of in such a way as to avoid the contamination of soil or water resources.
2. This estimate represents the capital expenditure required for infrastructure expansion, and does not include the capital and operational expenditures required to sustain existing services over that time period.
3. Although hygiene is a crucial component of what is often referred to as the water supply, sanitation, and hygiene (WASH) sector, our paper focuses on subsidies supporting the delivery of *services*, and thus on water and sanitation, to the exclusion of hygiene.
4. The economic subsidy of a utility is calculated as the difference between revenue and the economic cost of service. The economic cost of service encompasses all the economic resources deployed for service provision, including the cost of not only O&M but also all capital (depreciation plus return on capital), as well as costs imposed by operational inefficiencies. The methodology used to estimate the economic cost of service provision for each utility in the IBNET database is discussed in detail in appendix B.
5. China and India were notably excluded due to insufficient data and the fact that their singularity makes estimates based on extrapolation impossible.
6. As discussed in chapter 2, box 2.4, we estimate (using analysis by Fay et al. 2019) that global capital expenditure on WSS infrastructure investment is approximately 0.4 percent of global GDP per year. This figure includes capital expenditure for infrastructure expansion—not included in our estimation—and some fraction of expenditure on infrastructure replacement—which our model captures in full. Therefore, an estimate of the full magnitude of global subsidies in the sector would require adjusting our estimate upward by some undetermined portion of this 0.4 percent of global GDP.
7. Building on the methods of Komives et al. (2005) and Angel-Urdinola and Wodon (2011), we provide new estimates of the performance of piped-water consumption subsidies in terms of pro-poor targeting across 10 countries: Ethiopia, Mali, Niger, Nigeria, Uganda, El Salvador, Jamaica, Panama, Bangladesh, and Vietnam.
8. Error of inclusion is measured by the percentage of all beneficiary households that are rich; error of exclusion is measured by the percentage of poor households that do not get a subsidy. Poor households are defined as belonging to the first four deciles of the expenditure (or income) distribution in each country.
9. Note that not all interest groups will be politically organized. Moreover, within governments themselves, officials may hold conflicting positions regarding subsidy policy.

Abbreviations

CAPEX	capital expenditure
CLTS	community-led total sanitation
GDP	gross domestic product
GLAAS	Global Analysis and Assessment of Sanitation and Water
IBNET	International Benchmarking Network for Water and Sanitation Utilities
IBT	increasing block tariff
O&M	operation and maintenance
OPEX	operating expenditure
SDG	Sustainable Development Goal
UN	United Nations
WHO	World Health Organization
WSS	water supply and sanitation





CHAPTER 1

Setting the Stage

The United Nations' Sustainable Development Goals (SDGs) for 2030 represent a major shift in global ambitions for the quality and coverage of water supply and sanitation (WSS)¹ services. Almost two decades ago, the United Nations' Millennium Development Goals focused on *halving* the number of people living without access to improved WSS services by 2015.² Today, the SDGs envision *all* the world's people as having equitable access to *safely managed* water and sanitation services,³ a more stringent technical standard, *by the year 2030*. In 2016 the World Bank estimated that it would cost the world's nations approximately \$100 billion a year in the period 2015-30 to attain this (Hutton and Varughese 2016). However high this estimate might sound, it does not even include the maintenance, repair, and replacement of existing infrastructure stock, or investment in climate-resilient infrastructure. These capital demands, coupled with sobering statistics on global rates of access to WSS services, underline a key fact: Securing the basic human rights of access to clean drinking water and sanitation depends on the *effective* and *efficient* use of scarce financial resources.

The effective pricing of WSS service provision, a prerequisite for its sustainability, would serve to promote efficient water use among customers, generate sufficient revenue to maintain and replace existing infrastructure stock, and ensure access to the capital needed to expand services to underserved populations. Yet in spite of these benefits, the process by which high-income countries have achieved high levels of access to water and sanitation clearly demonstrates that domestic public finance, including targeted subsidies, has been and remains critically important to achieving universal coverage, even in strongly market-led economies (Fonseca and Pories 2017). Thus, funding the efforts needed to attain the SDGs will likely involve a combination of user fees and public subsidies. The scarcity of public resources in general—and particularly in those regions where poor populations are concentrated—demand that such subsidies be well designed, transparent, and targeted.

The WSS sector remains heavily subsidized around the world, as it has been for decades. Despite the prevalence of subsidies and the critical role that effective pricing plays in providers' ability to deliver high-quality WSS services, scant attention has been paid to how current WSS pricing structures and subsidies impede progress toward the SDGs. Although most subsidies are intended to ensure that water and sanitation services are affordable to the poor, they often end up benefiting relatively well-to-do households already connected to networked WSS services. The poorest of the poor, who generally lack access to networked services, are left without their basic human rights to clean drinking water and sanitation.⁴ And, most often, the poorest communities are located in regions and countries with limited capacity for public spending.

Given that, as this report will show, most subsidies are poorly targeted, expensive, nontransparent, and distortionary, it is urgent that policy makers reconsider how current spending is working, and carefully target available resources to achieve the greatest impact. An example of the distortive nature of the most pervasive networked service subsidies is their potential to reduce service quality and performance. Tariffs implemented by water and sanitation service providers in most low- and middle-income countries tend to be insufficient to cover their operational, administrative, and capital management costs, including depreciation. In order to cover the resulting financial shortfall, service providers are generally compensated by the appropriate financial authority through an ad hoc subsidy payment and/or neglect regular maintenance and other recurring expenses. When maintenance is neglected, the deterioration of assets is accelerated, causing a further reduction in service quality.

Although not to the extent of networked WSS services, some nonnetworked services are also being supported by government subsidies. For example, water

vendors using taps or kiosks or providers of communal latrines are often supported as acceptable short-term alternatives to networked provision in unplanned and densely populated slums. In rural communities, governments and development partners often construct hand pumps and small piped-water schemes with little or no financial contribution from the communities they serve. Some governments have also supported household-level water and sanitation facilities, whether through “hardware” subsidies of latrine or borehole construction, or “software” subsidies of initiatives seeking to raise community awareness of the need for hygienic practices and facilities.

In this report, we explore the question of how scarce public resources can be used most effectively within the WSS sector to achieve universal delivery of services. To inform our discussion, we analyze subsidies in the sector, including their magnitude, their efficacy in their various objectives, and the implications of poor design. We then provide guidance to policy makers on how subsidies can be better designed to improve their efficacy and efficiency in attaining their objectives. Finally, we discuss how to design a subsidy reform package that will have the best chance of success.

1.1 Water Supply and Sanitation Subsidies: Definition and Rationale

Before exploring the current WSS subsidy challenge and the approaches that policy makers can take to best move the sector forward, we begin with an overview of the economic rationale for subsidies, a classification of subsidies according to their particular characteristics, and a discussion of various approaches to funding them.

What Is a Subsidy?

Subsidies are a subset of funding flows between governments, service providers, and customers. Subsidies

occur when a user/customer pays less for a product or service than the service provider's cost, leaving a third party (e.g., government, other users, future generations) responsible for covering the difference. Subsidies may take the form of explicit financial transfers between two entities (e.g., a utility and a customer) or implicit transfers—such as nonpayment for electricity or deferred maintenance—which occur when products, services, or inputs are underpriced.

What Is the Economic Rationale for Subsidies?

Governments subsidize WSS services to achieve a variety of policy objectives; the two most common are (i) to advance equitable access to affordable WSS services, and (ii) to harness the positive externalities associated with WSS services.⁵

Advancing Equitable Access to Affordable WSS Services

Subsidies may be considered desirable if they help poor or marginalized segments of a population attain access to affordable WSS services. If poor households are less likely than rich households to have access to water or sanitation services, then subsidizing their access costs may promote equity. Subsidizing consumption may, in some circumstances, facilitate the regular use of a minimum quantity of potable water required for drinking, cooking, and hygiene purposes. Similar arguments for fairness of access can be applied to marginalized or historically excluded groups (McCarthy 2019).⁶ The obligation to ensure the human right to water and sanitation, as declared by the United Nations, can also serve as justification for subsidies.

On the financial side, households' lack of access to credit may offer a rationale for the use of subsidies to encourage investment in WSS services. Households without access to credit may find they cannot afford to pay the up-front charges required to connect to a

water or sanitation network. In such circumstances, subsidized connection charges or the provision of financing at subsidized interest rates may be considered.

In the case of networked

WSS services, subsidies to network providers may support the capital expenditure required to expand these services to new customers. The provision of WSS services, particularly networked services, is characterized by strong economies of scale and scope (Tynan and Kingdom 2005). Economies of scale refer to the reduction in average costs as a system expands and incorporates more users, while economies of scope refer to the lowered costs of providing water and sanitation services together as compared with providing each service separately. Under these conditions, subsidizing infrastructure at the provider level, as well as the connection charges of new users who would not otherwise connect, can result in greater operational efficiency, leading to lower long-run costs. These lower costs, in turn, render services more affordable to all customers. In other words, financial transfers from the government may be justified to increase the size and coverage of infrastructure to a point where economies of scale can be fully exploited. This rationale, however, presupposes that the service provider is not losing money for every unit of water sold, which is often the case.

Harnessing the Positive Externalities Associated with WSS Services

Positive externalities may arise when the societal benefits of increased consumption (or production) exceed the private benefits. If the consumption (or production) of a good or service involves externalities, the resource allocation resulting from a free-market equilibrium will be inefficient from

Subsidies occur when a user/customer pays less for a product or service than the service provider's cost.

a social perspective. Specifically, there will be underconsumption of the good or service. To reach a more socially optimal consumption level, subsidies of production or consumption may be introduced.

Access to improved WSS services has a strong, positive impact on human capital accumulation. WSS services underlie and impact all five indicators of the World Bank's Human Capital Index,² which quantifies the contribution of health and education to the productivity of the next generation of workers (Andres et al. 2018). The primary pathways for this contribution include positive environmental impacts and improvements in health—in particular, a reduction in the rates of diarrheal disease and child mortality rates—and an associated reduction in health-care expenses (Alsan and Goldin 2019; Gamper-Rabindran, Khan, and Timmins 2010; Prüss-Üstün et al. 2008, 2014; Van Bueren and MacDonald 2004; World Bank Group 2018b; and Wolf et al. 2018). At the aggregate level, this translates into a lower incidence of water-related disease. The existence of positive externalities implies that consumption based on cost-reflective tariffs would be below the optimal level (as individual consumers do not internalize the positive impact on other potential consumers).

In addition, water and sanitation can be seen as "merit goods" that would be underprovided—and underconsumed—if their supply were left entirely to the market. This is because individuals tend to be myopic, often ignoring the long-term benefits of needed investments. A subsidy can correct this by inducing a higher consumption level. Merit goods are defined as goods for which an individual's consumption matters to society as a whole, not necessarily because of any spillover effect on society (as in the case of externalities) but because it is central to the well-being of the individual. As a result, governments take an interest in how much of the good each individual

consumes and may choose to intervene by subsidizing consumption (Komives et al. 2005).

These arguments provide the economic rationale for subsidies to facilitate access to WSS services and their adequate consumption, particularly among the poor. When properly designed to achieve these specific objectives, subsidies of WSS services can be valid instruments to achieve sectoral and social goals.

1.2 Dominant and Emerging Service Delivery Models

The form that subsidies take in a particular country depends substantially on the particular models of service delivery that they seek to support. This is because each service delivery model presents its own unique institutional arrangement, level of state involvement, cost structure, revenue streams, and degree of competition, among other factors.

Service provision models may be categorized by the technology employed and the management structure. In the WSS sector, the choice of model is influenced by a variety of factors, including environmental and geographic conditions, political and institutional realities, population density, technical and financial capacity, and social acceptability. Water supply service models can generally be classified into two broad categories: networked and nonnetworked. Similarly, sanitation service models are typically classified as either sewerage or on-site. For our purposes, networked water supply and sewerage sanitation solutions will be grouped together, given their many similarities.

The provision of both networked water and sewerage sanitation services involves the use of piped networks. These are used to either distribute water to consumers or collect wastewater from them. Such networks are generally managed by a public or private entity that serves a large and fairly heterogeneous group of users. These users receive a service (the distribution of

water and/or the collection of human waste), as well as a product (the water itself). Networked distribution and collection entail very high capital costs for long-lived, specific assets—costs that need to be recovered over the assets’ economic lives. Also, the service is provided on a continuous basis and has little or no substitutes, therefore facilitating the financing of these capital costs through their incorporation into recurrent user tariffs.

The provision of nonnetworked water supply and on-site sanitation services may involve a variety of technologies. For water supply, these technologies include wells mounted with hand pumps or with motorized pumps connected to standpipes, among others. Processes involving rainwater harvesting or sand dams may be utilized. And water may be distributed via tankers or sold in bottles or sachets, among other options.⁸ In the case of sanitation, human waste may be collected and possibly treated on location, generally using either pit latrines or septic tanks. Small-scale, decentralized off-site collection and treatment solutions may also be applied. These are often grouped with on-site technologies since they operate at a similar scale.

For analytical purposes, we further divide the provision of nonnetworked water supply or on-site sanitation services into two categories: isolated and continuous. The distinction between these centers on the nature of the relationship between the service provider and the consumers—does it involve distinct, isolated transactions, or is it continuous? The two categories may be summarized as follows:

- **Isolated provision.** Instead of regular payments to a service provider that guarantee the continuous availability of water supply or sanitation services (as would be the case for networked water or sewerage sanitation), the consumer makes one-off payments to the provider. These may be for the construction, maintenance, or repair of infrastructure

wholly owned by the consumer or a community of consumers (e.g., community- or household-level water points and water schemes, pit latrines, and septic tanks, among others). Or a one-off payment may be for the one-time provision of a quantity of water (e.g., via kiosks and standpipes with pay-per-use arrangements, tanker deliveries, bottled or sachet water, etc.). No further transactions are expected or required, and no guarantee of continued service or functionality is provided.

- **Continuous service provision.** Nonnetworked water and on-site sanitation services classified as *continuous* exhibit a relationship between the service provider and the customer very similar to that in networked water and sewerage sanitation service provision. Users are charged regular consumption fees by a service provider that guarantees the continued availability of service by asserting responsibility for all associated maintenance and repair. For water supply, the technologies involved, generally hand pumps or motorized pumps, are the same as for many isolated systems. Yet in these cases, the users are paying for a continuous supply of water using assets that they may or may not own, as opposed to paying for and managing the assets themselves. Although many community-level water projects are intended to be sustained through these regular consumption fees, the collection of such fees is not very common in practice. In recent years, several nonprofit and development organizations, such as Whave in Uganda, have experimented with preventative maintenance agreements, whereby communities pay regular fees to a local technician who ensures the continuous functionality of a water facility (Stites, Howe, and Akabwai 2017). More common examples include subscription water delivery services through, for example, tanker deliveries.

A regular fee is charged for a particular quantity of water delivered at regular intervals. Similarly, for sanitation services, all or part of the sanitation service chain may be provided continuously.² For example, the initial investments in latrines/septic tanks may be isolated, while fecal sludge management is continuous. Additionally, a growing number of container-based sanitation service providers offer regular access to sanitation facilities (at home or in public spaces) that are continuously managed in exchange for fees collected on a regular basis (either usage fees or monthly service fees). Continuous service arrangements include those managed by communities, public (government) agencies, and private entities, including, for example, under management contracts.

1.3 A Classification of Subsidies

In the previous two sections, we defined subsidies, discussed the most common rationales for their implementation, and presented the dominant and emerging models of service delivery in the WSS sector. We will now introduce a comprehensive framework for classifying common types of WSS subsidies. We first classify subsidies according to their purpose and design, then discuss how they are generally funded, including both the transfer mechanism and funding source.

To frame our discussion, we have categorized WSS subsidies using several criteria. First, we consider whether subsidies seek to expand access (e.g., by covering connection charges, initial access costs, specific assets, etc.) or ensure a minimum level of consumption (i.e., the regular use of a certain level of service). We then consider the intended beneficiaries, and the targeting mechanism used. These elements are outlined in more detail in tables 1.1 and 1.2.

Subsidies are at the intersection of a service and a user type (or all users, in the case of untargeted

subsidies). It is worth mentioning that even untargeted subsidies are necessarily linked to a specific service type. Thus, untargeted connection subsidies will reach (all) future yet presently unconnected users, while untargeted consumption subsidies will benefit (all) connected users.

Networked Water and Sewered Sanitation Services

Access and Consumption Subsidies. **The first criterion we use to categorize subsidies in the WSS sector is their goal; a subsidy may seek to either (i) expand access or (ii) ensure a minimum level of consumption.** In this way, supply-side subsidies that directly target a service provider's expenditures are classified by whether they lower the cost of *connection* and/or *consumption* for consumers. These expenditures can be divided into two types: capital expenditure (CAPEX) and operating expenditure (OPEX). CAPEX includes the costs of the acquisition, construction, installation, repair, or replacement of a service provider's fixed assets, while OPEX includes all ongoing costs of providing service, including administrative costs such as billing and collections, staffing, and customer outreach, as well as regular maintenance of fixed assets.¹⁰ In the case of sanitation, investments in household containment options and sewer connections are categorized as expanding access whereas the remainder of the service chain is considered part of consumption.

There are important differences between the two regarding their prospective beneficiaries and frequency of payment. First, the possible recipients are mutually exclusive: while access subsidies benefit only unconnected users, consumption subsidies benefit only those with a connection. Second, consumption subsidies are paid on a regular basis, while access subsidies are paid only once,¹¹ hence implying a lower administrative cost.

TABLE 1.1. Dimensions of Subsidies Intended to Expand Access to Water Supply and Sanitation Services

Subsidized services			Targeted subsidies			
Subsidized costs		Untargeted subsidies	Implicit subsidies	Explicit subsidies		
				Self-selection	Administrative selection	
Networked/sewered and nonnetworked/on-site continuous services	Connection to network	Costs of connecting to existing network	No connection charge ⇒ all new customers Subsidized interest rate for financing connections ⇒ all new customers that use finance	Flat connection charge ⇒ new customers who cost more than average to connect	Lower connection charge for customers providing labor or materials ⇒ customers that choose to provide labor/materials Subsidy to cover (part of) connection charges for a particular service level or technical design ⇒ customers that choose this service level or technical design	Lower connection charges based on: • Geographical discrimination ⇒ customers who live in certain areas • Means tests (or social connections) ⇒ households classified as poor • Other qualifying customer characteristics ⇒ customers meeting those characteristics (e.g., pensioners or families with children)
	On-premise adaptation	Costs of adapting internal system (particularly for sewage)	Subsidy to cover (part of) adaptation costs ⇒ all new connections to the network that require adaptation Subsidized interest rate for financing adaptation ⇒ all new connections to the network that use finance for required adaptations	Subsidy to cover (part of) adaptation costs for customers providing labor or materials ⇒ customers that choose to provide labor/materials Subsidy to cover (part of) adaptation costs for different service level or technical design ⇒ customers that choose this service level or technical design	Subsidy to cover (part of) adaptation costs based on: • Geographical discrimination ⇒ customers who live in certain areas • Means tests (or social connections) ⇒ households classified as poor • Other qualifying customer characteristics ⇒ customers meeting those characteristics (e.g., pensioners or families with children)	
Nonnetworked/on-site services	Initial costs	Cost of constructing individual/communal water facility (pump installation, borehole excavation, etc.)	Installation free of charge ⇒ all new users Subsidized interest rate for financing new installation ⇒ all new users that choose to use finance	Flat fee for installation ⇒ new users whose installation costs are higher than average	Subsidy to cover (part of) the cost/price of certain services or a particular service level (e.g., only pit latrines or only shared pumps) ⇒ households that choose this service level Subsidy to cover (part of) household costs of labor or materials ⇒ households that choose to provide labor/materials	Subsidy to cover (part of) costs based on: • Geographical discrimination ⇒ users who live in certain areas • Means tests ⇒ households classified as poor • Other qualifying user characteristics ⇒ users meeting those characteristics (e.g., pensioners, families with children, or those without a latrine on premises)
		Cost of constructing individual sanitation facility (e.g., latrine)				

Source: Authors' elaboration based on table 2.1 of Komives et al. (2005).

Note: The users described after the symbol "⇒" are the intended beneficiaries of the subsidy.

TABLE 1.2. Dimensions of Subsidies Intended to Expand Consumption of Water Supply and Sanitation Services

	Subsidized services	Subsidized costs	Untargeted subsidies	Targeted subsidies		
				Implicit subsidies	Explicit subsidies	
					Self-selection	Administrative selection
Networked/sewered and nonnetworked/on-site continuous services	Unmetered water services and flat rate sanitation fees	Water/sewage costs for customers with no individual meter fees	Across-the-board fee $\Rightarrow$ all customers	Flat fee per connection $\Rightarrow$ higher-volume consumers with unmetered connections	The selection of metered or unmetered services (or even nonnetworked services like public water taps) $\Rightarrow$ customers using the applicable service Lower fees for low-pressure water services $\Rightarrow$ customers with connections to low-pressure water services	Reduced prices based on: - Geographical discrimination $\Rightarrow$ customers who live in certain areas - Means tests $\Rightarrow$ households classified as poor - Other customer characteristics $\Rightarrow$ pensioners or families with children - Burden limit cash transfers $\Rightarrow$ households whose utility bills and housing expenditure exceed a defined burden limit
	Metered water services and volume-based sanitation fees	Water/sewage costs for customers with individual meters	Across-the-board price $\Rightarrow$ all customers	Low collection rate with no disconnection policy $\Rightarrow$ all customers who do not pay their bills Illegal connections $\Rightarrow$ those with illegal connections Combined water and sewage tariffs $\Rightarrow$ customers with water and sewer connections Single volumetric charge (when costs vary by customer or time of use) $\Rightarrow$ high-cost customers	Increasing block tariffs $\Rightarrow$ low-volume consumers with meters Volume-differentiated tariffs $\Rightarrow$ customers with metered private connections who consume less than x units per month Lower prices for low-pressure water services $\Rightarrow$ customers with connections to low-pressure water services	Reduced prices based on: - Geographical discrimination $\Rightarrow$ customers who live in certain areas - Means tests $\Rightarrow$ households classified as poor - Other customer characteristics $\Rightarrow$ pensioners or families with children - Burden limit cash transfers $\Rightarrow$ households whose utility bills and housing expenditure exceed a defined burden limit
Nonnetworked/on-site isolated services	Water distribution (trucks, etc.) Pit/tank emptying (isolated services)	Cost of service provided by water vendors Cost of pit/tank emptying	Reduced price for all users (water or sanitation) $\Rightarrow$ all users	Single price when provision costs vary across users $\Rightarrow$ users in remote or otherwise costlier-to-access areas	Reduced price for particular services or a service quality level (e.g., only water provided in 20-liter jerry cans) $\Rightarrow$ users that choose this service level	Reduced prices based on: - Geographical discrimination $\Rightarrow$ customers who live in certain areas - Means tests $\Rightarrow$ households classified as poor - Other customer characteristics $\Rightarrow$ pensioners or families with children

Source: Authors' elaboration based on table 2.1 of Komives et al. (2005).

Note: The users described after the symbol " $\Rightarrow$ " are the intended beneficiaries of the subsidy.

The costs that a user must pay to gain access to a water supply or sanitation service may involve connection charges, initial costs, or both. Connection charges typically involve a one-time payment for the installation of facilities needed to provide a consumer with access to a given service network (either water supply or sanitation). Initial costs, similarly, involve a one-time payment for the installation of facilities. However, instead of providing access to a network, these facilities either directly provide water or sanitation services to the user, independent of a network, or are facilities on household premises that can be considered as prerequisites to network connection (such as bathrooms, drains, plumbing, or fixtures such as toilets).

Consumption subsidies take the form of reduced (below cost) unit prices for users already connected to the network. As consumption recurs over time, subsidies involve a continuous flow of resources to cover the difference between the cost of each consumed unit and the price paid by users.

Consumer Targeting. **The second and third criteria by which we categorize subsidies are (i) the intended beneficiaries and (ii) the particular targeting mechanism implemented.** If the intended beneficiaries are an entire population or a service provider’s entire customer base, then subsidies may be considered **untargeted** (figure 1.1). If, on the other hand, the intended

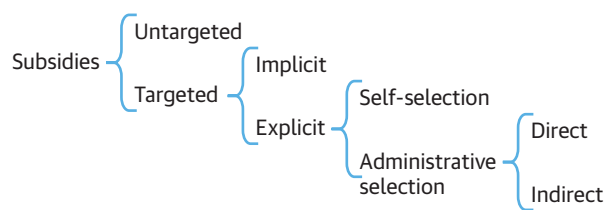
beneficiaries are a distinct subset of the population or customer base (e.g., poor households), then subsidies are **targeted**. The intended beneficiaries of most targeted subsidy schemes in the WSS sector are the poorest segments of a population.¹²

If subsidies are not applied across the board (i.e., to all populations), some sort of targeting is involved, whether explicit or implicit. Explicit targeting, in turn, may rely on either self-selection or administrative selection (direct or indirect) mechanisms.

Self-selection mechanisms rely on consumers’ selection of a service category (subsidized or nonsubsidized). This can be realized through product or service differentiation. For example, a utility might provide networked water services via private connections on household premises, or alternatively, through public standpipes or through water kiosks priced below cost. Self-selection can also be realized through price structures in which the unit price varies based on consumption—customers can effectively “self-select” different unit prices by altering their consumption. The logic behind increasing block tariffs (IBTs) and lifeline tariffs rests on the assumption that poor households consume less than rich ones (an assumption that, in many contexts, may prove false; see box 2.1). Self-selection mechanisms carry a comparatively low administrative burden for targeting.

Administrative selection, on the other hand, is based on a classification of consumers that relies on observable variables. Ideally, this classification should be based on consumers’ income or wealth and social characteristics, so that subsidies flow to those segments of the population that need them the most. For this purpose, means-tested subsidies, based on consumers’ income or wealth, may be used. The use of this *direct* mechanism assumes that income/wealth is observable, and that an administrative system to monitor the scheme is in place. Unfortunately,

FIGURE 1.1. Categorization of Subsidies



Source: Authors’ compilation.

consumers' wealth is seldom observable, so an *indirect* targeting mechanism is generally used.

Indirect targeting relies on certain observable variables, such as geographical location or housing quality, that are used as proxies to measure consumers' income or wealth. Thus, eligibility for a subsidy may be based on residence in a certain neighborhood or dwelling type identified as poor.¹³ Other mechanisms are based on consumers' characteristics (e.g., pensioners, veterans, individuals with disabilities, female-headed households, the elderly, historically discriminated-against or excluded groups). As administrative selection mechanisms are based on an *ex ante* classification and selection of consumers, they require an administrative system (usually a costly one) capable of monitoring and verification. See figure 1.3 for subsidy categories.

Nonnetworked Water and On-Site Sanitation Services

In addition to networked services, subsidies may be applied to nonnetworked water supply and sewerage sanitation services involving alternative sources or suppliers. In urban and peri-urban neighborhoods (e.g., unplanned and densely populated slums), water vendors may sell water from taps or kiosks; community block latrines may stand in for sewerage sanitation. Household-level costs to upgrade sanitation facilities and interior plumbing to facilitate connection to networked water and sewerage sanitation services can also be subsidized. Other subsidies incentivize the safe collection, transport, treatment, and disposal/reuse of fecal sludge among various entities engaged in septic hauling (e.g., social enterprises that offer container-based sanitation services or traditional septic haulers). Public funds may additionally promote the development of new technologies for urban and peri-urban areas that treat waste *in-situ*. In rural communities, community-level hand pumps and small

pipaged-water schemes, as well as household-level sanitation facilities and campaigns to raise awareness of the advantages of quality sanitation, may benefit from subsidies (World Bank Group 2017a).

The question of who or what should be subsidized depends on the nature of the service. In the case of *isolated service provision*, both access and consumption subsidies will involve the subsidization of non-recurring, one-off charges. Access subsidies typically involve a one-time monetary transfer, either directly to the user or indirectly through a service provider, to subsidize the construction of either community- or household-level water or sanitation facilities. Consumption subsidies also involve a one-time monetary transfer, either directly to the user or indirectly through a service provider, to subsidize the one-time servicing or maintenance of existing facilities owned by the community or household (e.g., maintenance or repair of water points and water schemes, one-time emptying/conveyance of fecal sludge, etc.), or the one-time provision of a quantity of water (e.g., through kiosks and standpipes with pay-per-use arrangements, tanker deliveries, bottled and sachet water, etc.). Therefore, consumption subsidies for isolated service provision differ from those for networked services, as they do not contractually require a continuous flow of resources to subsidize recurrent costs.

Since the process of collecting payment for continuous service provision strongly reflects that of networked service provision, subsidies for the two types of provision also share many of the same characteristics. Access subsidies for water points and small water schemes may include the subsidization of the construction of community-level water or sanitation facilities. Consumption subsidies will involve a continuous flow of resources to cover the difference between the cost of each consumed unit and the price paid by users.

1.4 How Are Subsidies Funded?

The costs of WSS subsidies are typically covered by one of two options: government funds (which in turn are funded by taxpayers), and funds that arise from charging other present and/or future users more than the cost of service. In low-income countries, there is often an additional source of funds: philanthropic funds, which include both grants and concessional loans provided by other countries (either directly or through international credit agencies), nongovernmental organizations, and foundations.

Transfer Mechanisms

Depending on who ultimately pays for the subsidy—taxpayers, philanthropic organizations, or a particular group of present and/or future users—the mechanism of the transfer between the payer and recipient may vary. To a large extent, the choice of mechanism will be influenced by the type of service involved, and the technological and institutional setup of the sector. Here, we consider two basic funding mechanisms:

- A **demand-side subsidy** involves a direct transfer from the fund provider to the subsidized user. In plain terms, the government transfers money directly to the user,¹⁴ who then uses it to pay the service provider (whether for one-time or continuous service provision). This mechanism is the most transparent and arguably entails a minimum distortion in resource allocation. Examples include both conditional cash and in-kind transfers directly to consumers.
- In the case of a **supplier-side subsidy**, funds are channeled through the service provider or another third party, which, in theory, passes the funds on to the consumer in the form of lower prices.

Two aspects of transfer mechanisms are worth highlighting. The first is the **transfer channel**, which may

simply be a change (increase) in a provider's revenues or a reduction in its expenses (costs). Changes in revenue may be linked to tariffs that diverge from the cost of service or general transfers. Cost reductions may be due to either reduced input prices or below-cost investments. The second is the **origin of the funds**. Unlike demand-side subsidies, which can originate only from government or philanthropic funds, subsidies that involve the service provider as the transfer mechanism can originate from government funds, philanthropic funds, other present and/or future users, or other sectors (funds from other users or other sectors can both be categorized as cross-subsidies). In all these cases the transfer can follow a predefined rule or be the result of a later decision to cover revenue shortfalls.

The interplay between the different transfer channels and fund origins is depicted in table 1.3.

Funding Sources

Government- and Philanthropic-Funded Subsidies. **Government and philanthropic organizations may provide project-based support to directly fund, in full or in part, infrastructure rehabilitation or expansion.** This type of funding, which is explicitly allocated to an investment project, is generally more transparent than subsidies that support recurring costs.

In the simplest configuration of subsidies for recurring costs, the government or philanthropic organization pays the service provider the difference between a fully cost-reflective tariff and the amount billed to the consumer. This requires defining cost-reflective tariffs for each customer category,¹⁵ and then choosing one or several consumer categories (typically the poorest) to subsidize.¹⁶

In an alternative arrangement, and one that is less transparent, the service provider receives general funding support (direct fiscal transfers from government) to cover revenue shortfalls. In this case the

TABLE 1.3. Transfer Channels

Transfer channel		Origin of subsidies' funding					
		Government/philanthropy		Cross-subsidy by other users		Cross-subsidy by other sectors	
		(This includes government and philanthropic funds into the sector)		(This can occur only under the assumption that the service provider is in overall equilibrium)			
		Explicit	Implicit	Explicit	Implicit	Explicit	Implicit
Changes in revenues	Transfers	Government covers revenue shortfalls through a predefined mechanism or through a later loan or direct transfer		Explicit charge to users feeds a fund used to complement revenues		Explicit charge to users of another service feeds a water fund	
	Tariffs	Government/philanthropy pays difference between cost-reflective tariff and amount invoiced to final user		Explicit cross-subsidy rule establishes the subsidy and the surcharge	Shortfalls from subsidized users are recovered through charges to other users	One type of service subsidizes another (e.g., electricity and water) in a utility that combines services	
Reduction in expenditures (costs)	CAPEX	Government/philanthropy funds certain investment projects	Government (through its general revenues) /philanthropy provide implicit guarantees to loans			Common infrastructure (i.e., dams) charged only to other sector users (i.e., electricity)	
	OPEX	Government provides inputs at market price (i.e., energy) at subsidized prices	Inputs with no market price (raw water) provided at below efficient costs			Subsidy to water input (i.e., energy) is recovered through charges to other users	Utility accumulates commercial debt with input providers
	Taxes	Water and sanitation utilities are exempt from general taxes					

Source: Authors' compilation.

Note: CAPEX = capital expenditure; OPEX = operating expenditure.

funding is not related to the tariffs of specified user categories but rather becomes an alternative source of revenue that helps offset the cost of service. In many cases, this funding is accompanied by government-imposed limits on tariffs charged to users.

Another form of this type of subsidy, usually granted by international donors through governments, is output-based aid. This is a form of results-based funding designed to enhance access to and delivery of infrastructure and social services for the poor through the use of performance-based incentives, rewards, or subsidies. Output-based aid links the payment of aid to the delivery of specific services or “outputs” (e.g., the number of poor households connected to the water network).¹⁷ Service delivery is contracted out to a third party—public or private—that receives a subsidy to complement or replace the contribution required of users. The service provider is responsible for prefinancing the project and is reimbursed only after the services or outputs have been delivered and fully verified by an independent agent.¹⁸

In recent years, innovative types of fundraising by governments and philanthropists have been proposed, and in some cases, implemented. Solidarity levies, or a small surtax on a specific industry or consumer item, help global partnerships raise funds within high-income countries for use within particular sectors in low-income countries. This approach has been successful in the health sector: Unitaid, created in 2006 to raise money to combat HIV/AIDS, tuberculosis, and malaria, is now largely funded by an airline tax. Such a surtax has been suggested for bottled water to raise money for the water sector. Another innovative approach, land value capture, allows governments to raise domestic funds. This market-based approach allows governments to capture land price increases resulting from public investments, which can then be used to fund public infrastructure (Nagpal et al. 2018).

Cross-Subsidization by other Users. **Cross-subsidization by other users, on the other hand, is generated within a provider's operations.** Broadly speaking, we define cross-subsidies as a pricing structure in which a group of customers is billed a tariff above the average unit cost of provision, while another group is billed a tariff below the average unit cost of provision.¹⁹ In other words, cross-subsidies are a way of paying for at least a portion of the costs of providing service to one group of consumers, through a surcharge on another group. For example, industrial customers may pay prices in excess of costs to subsidize residential consumption; high-volume or high-income consumers within the residential segment may subsidize low-volume or low-income users in the same segment; or networked users may subsidize nonnetworked users.²⁰ Cross-subsidies will generally result from an explicit policy set by the government or regulator.

However, the mere existence of a differentiated tariff structure, whether for different consumer categories and/or different volumes of a good or service (as in the case of increasing block tariffs), does not imply the existence of cross-subsidies. First, tariffs differentiated by customer category may simply reflect a common costs policy (i.e., all customers are paying the respective costs of their service provision). Second, even where tariffs are differentiated, if all are below the cost of service, then all are being subsidized; that is, there is no cross-subsidization because no consumers are covering the cost of their service.

Thus, to summarize, cross-subsidies are a specific subcategory of price discrimination wherein a subset of consumers serves as the funding source for the subsidization of another subset of consumers. Even so, and regardless of the distinction, all differential pricing policies will generally be perceived as forms of cross-subsidy by the public. This is due to a lack of transparency in pricing—consumers are generally unaware of the difference between the true cost of

service and their billed rate. Consumers therefore assume that if they are being charged more than their peers, they are paying more than the cost of their service.

Cross-subsidies are most commonly (and easily) applied to networked services, because of the technological characteristics of networks. The provision of a continuous and regular service to a heterogeneous universe of users allows market segmentation and price discrimination, since resale is not feasible at a large scale. At the same time, since a provider of networked WSS services is a natural monopoly, it is possible to charge some users tariffs above the direct (marginal/incremental) costs of serving them.

Providers of nonnetworked, continuous services can also cross-subsidize across consumer categories; iso-

lated service provision, on the other hand, offers limited space for cross-subsidies.²¹ Where the same company provides both networked and non-networked services, it can set tariffs so that nonnetworked users are, in

effect, being funded by networked users. For example, in Burkina Faso, on-site sanitation is subsidized via the proceeds of a sanitation fee levied on customers receiving sewerage services (Trémolet, Kolsky, and Perez 2010).

Cross-Subsidization Involving more than One Service or Sector. **A third alternative, and a second type of cross-subsidy, is funding that originates from consumers or providers of another service.** In the case of companies that provide more than one service, it is not unusual to find that the tariffs applied for one service are, in effect, funding the costs of another. For example, among networked service providers,

water tariffs may be set beyond the rate required for cost recovery, with the resulting difference used to subsidize sanitation. Service providers or cooperatives that provide services unrelated to water or sanitation—such as energy, telecommunications, or solid waste collection—may also use this model of funding. For example, consumers of non-WSS services (e.g., telecommunications, energy) may be required to pay specific contributions to a water or infrastructure fund, which is then used to provide subsidies to the WSS sector. Or, as is common around the world, non-WSS service providers may be required by governments to supply their services to WSS providers free of charge (e.g., energy, a key input into WSS service provision),²² implicitly subsidizing the sector.

Intergenerational Subsidies. **Intergenerational subsidies do not involve a fund transfer but instead center on the underpricing or overpricing of current services, which affects future generations.** If services are underpriced today, future generations will have to pay more of the service provider's capital costs than their share of the benefits would indicate, since payments toward those costs have been deferred (and assets not properly maintained or replaced). In the less common case of overpricing, capital investment may be frontloaded such that the costs are not adequately distributed across the life of an asset, so that future generations might theoretically pay less than their fair share.

Tariffs based on historic costs (assuming these represent the value of the investment made by the company) will ensure the economic viability of the service provider but, if below replacement costs, do not reflect the economic cost of providing the service. A depreciation charge based on historic costs will not cover the maintenance required to sustain the operational capacity of a system.²³ When depreciation

If services are underpriced today, future generations will have to pay more than their share.

estimates are below replacement costs (as when the capital base is undervalued), this is in effect an implicit subsidy: current users are paying less than the economic cost of the assets used to provide them service.

Inefficient levels of maintenance similarly impose a higher cost on future users. If a financially constrained utility does not properly maintain its assets, it shortens their useful life, driving up future investment requirements. So, even if user tariffs are covering current (subpar) maintenance costs, they are imposing a higher cost on future users, resulting in an intergenerational transfer.

Notes

1. Although hygiene is a crucial component of what is often referred to as the water supply, sanitation, and hygiene (WASH) sector, our report focuses on subsidies supporting the delivery of services, and thus on water and sanitation, to the exclusion of hygiene.
2. Improved drinking water sources are those which, by nature of their design and construction, have the potential to deliver safe water, while improved sanitation facilities are those designed to hygienically separate excreta from human contact.
3. To meet the criteria for having a safely managed drinking water service, people must use an improved source of water that is (i) accessible on household premises, (ii) available when needed, and (iii) free from contamination. An improved sanitation facility is safely managed if it is not shared with other households and ensures that excreta is (i) treated and disposed in situ, (ii) stored temporarily and then emptied and transported to treatment off-site, or (iii) transported through a sewer with wastewater and then treated off-site.
4. Water and sanitation were recognized as human rights by the UN General Assembly and the Human Rights Council in Resolution 64/292 in 2010, and then again by the General Assembly in Resolution 70/169 in 2015.
5. As discussed in chapter 2, in many countries, particularly those with weak institutions, government subsidies are not only allocated based upon need, but also to advance political agendas by favoring particular groups. These decisions, informed more by political choice, may be undertaken under the guise of a legitimate rationale.
6. For example, in March 2019, the Canadian government announced a \$4.7 billion budget allocation to ensure universal access to safe drinking water for indigenous people on reserves within two years.
7. The Human Capital Index was developed through the World Bank's Human Capital Project, launched in October 2018. It combines five measures of human capital: (i) probability of survival to age 5, (ii) expected years of school, (iii) harmonized test scores, (iv) fraction of children under 5 not stunted, and (v) fraction of 15-year-olds surviving to age 60.
8. In our classification, nonnetworked provision can also include small piped-water schemes that are managed by an individual, a community, or a local public or private entity not classified as a utility. On account of this management structure, small piped-water schemes share many of the challenges associated with other types of nonnetworked provision.
9. The sanitation service chain includes household containment (e.g., toilets/latrines), emptying/conveyance of waste (through sewers or a functioning fecal sludge management system), treatment, and end use or safe disposal.
10. It is important to note that there is an inverse relationship between spending on OPEX and on major asset rehabilitation—the more that maintenance is starved of funds, the greater the need for periodic rehabilitation, and vice versa. The institutional setting is also a factor deciding the classification of OPEX and CAPEX since the outsourcing of certain tasks—for example, a build-operate-transfer contract for a treatment plant—turns, from the perspective of the firm, a CAPEX (investment in the plant) into an OPEX (payments under the contract).
11. Since access subsidies partially cover the one-time connection charges and/or initial costs required to gain access to the service, access subsidies are, in theory, paid only once. However, some service providers may permit customers to pay these access costs over time through their regular consumption bills. In this case, the service provider is effectively financing the one-time access costs, which, if financed at below-market rates, constitutes an implicit subsidy.
12. As previously noted, subsidy schemes also sometimes target marginalized or historically excluded populations to address historical injustices.
13. As an example of geographic targeting, MajiData, an online database for Kenya's water sector, contains data on more than 1,800 urban low-income areas in the 212 cities and towns of Kenya to improve sector decision making and targeting of resources (<http://majidata.go.ke/>). The Kenya Water Sector Trust Fund (WSTF), a Kenyan State Corporation under the Ministry of Water and Sanitation, assists counties in financing the development of water services in these marginalized areas (<https://www.waterfund.go.ke/>).
14. Note that the fund provider could alternatively transfer money to the service provider, who then pays the user in the form of reduced access or consumption charges.
15. Cost-reflective tariffs may differ across customer categories, generally stemming from differences in construction costs due to geographical or geological variation, or differences in service levels. For example, technologies such as condominium water and sewerage reduce the cost of networked service provision while potentially reducing the quality of service.

16. In addition to existing customers, customer categories to be subsidized may include potential customers (i.e., households currently lacking access to the service).
17. For example, a 2007 grant from the World Bank under the Global Partnership for Results-Based Approaches allowed Manila Water to install water service connections for customers in 45 urban poor communities at affordable rates (Rivera 2014).
18. Background paper 17 (prepared for this report; see appendix A) highlights the World Bank's significant experience with output-based aid through the Global Partnership for Results-Based Approaches (<http://www.gprba.org>).
19. This definition is different from that of Faulhaber (1975), who states that a cross-subsidy requires that a user or group of users pays less than the incremental cost and another pays more than the stand-alone cost. Also, the specific type of cost considered (average, marginal, stand-alone, incremental) gives rise to different definitions of cross-subsidies. See, for example, Beato (2000).
20. There could also be a cross-subsidization from existing to new customers, as when existing customers pay for the expansion of a water supply network into unserved areas.
21. But nonproportional cost allocations are sometimes found for capital expenditures at the community level. Additionally, isolated on-site sanitation services may be cross-subsidized across different consumer categories.
22. The free provision of energy to WSS service providers is rarely an explicit policy, but instead stems from a reluctance to terminate service when WSS service providers fail to pay their energy bill.
23. Furthermore, the return on capital, even if adequate from the service provider's perspective, will be less than the opportunity cost to society of the assets involved in service provision.





CHAPTER 2

The Challenges of Current Water Supply and Sanitation Subsidies

While subsidies of water supply and sanitation (WSS) service provision are generally implemented in pursuit of worthwhile objectives, poor design often undermines these objectives, rendering subsidies pervasive, expensive, poorly targeted, nontransparent, and distortionary. In this chapter, we present evidence on the current state of subsidies within the WSS sector and discuss particular design elements that most often prove problematic.

2.1 Subsidies Are Pervasive

Subsidies are found in the water and sanitation sectors of nearly all countries. Table 2.1 shows the prevalence of economic subsidies¹ and operation and maintenance (O&M) subsidies among the utilities included in the World Bank's International Benchmarking Network for Water and Sanitation Utilities (IBNET) database.

Only 14 percent of the utilities listed in the IBNET database generate enough revenue to cover the total economic costs of service provision, while only 35 percent of the utilities are able to cover, at a minimum, the O&M costs of service provision.

TABLE 2.1. Economic Subsidies and O&M Subsidies among Utilities

	Number of utilities	%		Number of utilities	%
No economic subsidy	220	14	No O&M subsidy	544	35
Economic subsidy	1,329	86	O&M subsidy	1,005	65
Total	1,549	100	Total	1,549	100

Source: Authors' calculations based on IBNET data, which cover utilities in 147 countries.

Note: IBNET = International Benchmarking Network for Water and Sanitation Utilities; O&M = operation and maintenance.

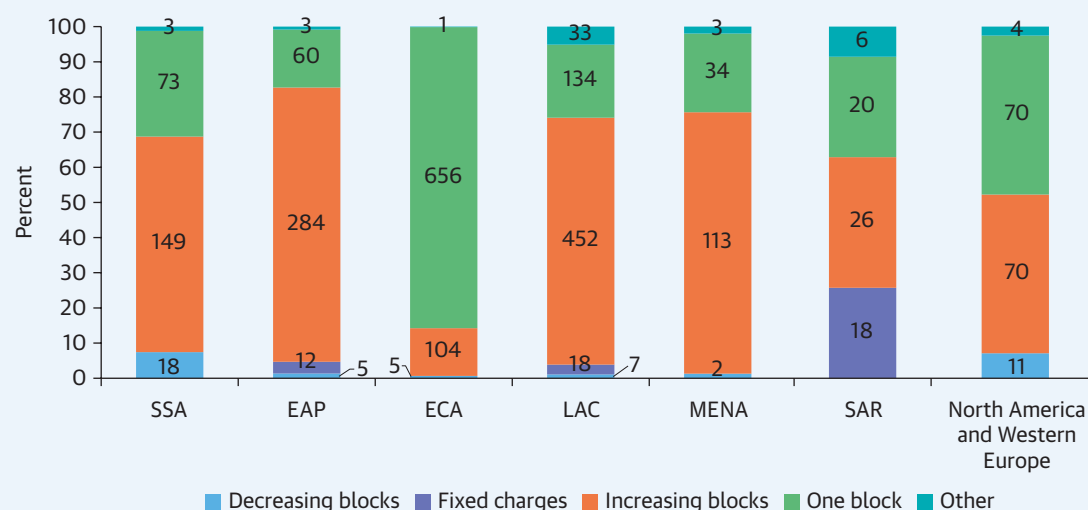
BOX 2.1. Increasing Block Tariffs

One of the most common types of subsidy, and maybe the most common for achieving distributional objectives—that is, for extending service to the poor—is the increasing block tariff (IBT).

IBTs have long been common in low- and middle-income countries. Consumption levels are divided into brackets, with a different unit price applied within each bracket. The unit price charged in lower consumption brackets is lower (and may even be free) than the unit prices charged in higher consumption brackets. In theory, the IBT structure allows utilities to meet the goals of equity (through the lower brackets) and conservation (through the higher brackets). Lower consumption brackets are often subsidized heavily to allow low-volume consumers to take advantage of infrastructure services. The assumption here is that the poor consume less than the rich, and that lower prices for lower brackets of consumption will allow the poor to access enough water to meet their basic needs. At the other end, high-volume consumers pay a higher price, which is expected to be closer to the long-term marginal cost. Therefore, the effective implementation of an IBT requires insulation from political pressure to increase the size of the lower consumption blocks (thus benefiting a larger share of the population) and a functional metering system, both of which are often lacking in low- and middle-income countries.

No database offers comprehensive data on the tariff structures in use globally. The most comprehensive sources of information are the IBNET tariff database and a survey of utilities conducted by Global Water Intelligence; about half the utilities covered in these two datasets use IBTs (figure B2.1.1). They are especially popular among utilities in Latin America (70 percent), the Middle East and North Africa (74 percent), and East Asia and Pacific (78 percent).

FIGURE B2.1.1. Summary of Tariff Structures Implemented, by Utilities in Various Regions



Source: IBNET tariff data (2018). Data for North America and western Europe are from Global Water Intelligence (GWI).

Note: Numbers within bars represent the number of utilities with the subject tariff structure. EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SAR = South Asia region; SSA = Sub-Saharan Africa.

box continues next page

BOX 2.1. continued

Despite their prevalence, there is an emerging consensus among policy researchers that IBTs are not an effective means of targeting subsidies to poor households.^a This inefficacy is the result of three main problems. First, in both rural and urban areas within low-income countries, many poor households are not connected to the piped network, therefore rendering them ineligible to receive subsidized water. Second, the correlation between piped water use and income is low (Fuente and Bartram 2018), meaning that subsidies delivered through the lower blocks are poorly targeted. Third, poor households are more likely to share water from their connection with other households, leading them to purchase more water at prices within the higher blocks of the IBTs.

Moreover, IBTs generally fail to encourage conservation through the higher consumption brackets. This results from the difficulty in understanding complex IBT tariff structures (Nauges and Whittington 2017) and the fact that customers tend to respond to average, not marginal, prices (Ito 2013).

Source: World Bank Group 2018c.

a. The World Bank has conducted and supported several early studies on the targeting of subsidies and municipal water services (e.g., Foster, Gómez-Lobos, and Halpern 2000; Walker et al. 2000; Komives et al. 2005; Banerjee et al. 2010; Angel-Urdinola and Wodon 2011). These, along with other research (Barde and Lehmann 2014; Whittington et al. 2015; Fuente et al. 2016) that uses a range of data sources and methods across several countries, seem to suggest that IBTs do not effectively target subsidies to low-income households.

Why Subsidies Are So Prevalent

As mentioned earlier, there are sound economic justifications for subsidizing WSS services that largely explain their pervasiveness. Given their ability to support important policy objectives, well-designed subsidies are and will continue to be vital to the sector. Yet their prospective benefits highlight the need to better understand why poorly designed subsidies, in particular, are so common.

Subsidies, notably poorly designed ones, are prevalent across countries of all regions and income levels, largely due to the political salience and visibility of water services. This is due not only to the social prominence of water and sanitation, but also to the nature of networked WSS services. The construction of new infrastructure, the expansion or improvement of service to households, and the reduction of tariffs can be directly attributed to the efforts of politicians. In many cases, subsidies are a tempting way for politicians to gain popularity with their

constituents (Mason, Harris, and Batley 2013). For the same reason, political actors may find it difficult to reduce existing subsidies or even to alter their design. Politicians' unwillingness to charge customers for the services they enjoy, or to disrupt the status quo, is one factor behind the commonly high levels of subsidies. As noted in World Bank Group (2002: 1), even following a series of conferences in the 1990s at which representatives of "many countries accepted the principle that the poor were willing to pay for good quality services and therefore should be charged for them, a long history of rural water sector subsidization posed significant challenges in implementing this policy."

The obligation to ensure the human right to water and sanitation, as declared by the United Nations, has

Subsidies, notably poorly designed ones, are prevalent across countries of all regions and income levels.

further cemented the role of subsidies in the sector.

While bringing welcome attention to the plight of billions of people without access to safely managed water and sanitation services (WHO 2017), the UN declaration of this right has bolstered arguments in favor of subsidization, as efforts to charge full cost-reflective tariffs necessary for the sustainability of these services can be seen as exclusionary.

Even where subsidies do not reach their intended beneficiaries, they often become entrenched owing to the interests of the stakeholders who do benefit from them, especially where these stakeholders are able to garner political support (box 2.2). These interest groups may include, for example, industrial, agricultural, and commercial consumers, and middle- and upper-income households who disproportionately benefit from access and low tariffs, as well as utility owners and employees, who may capture part of the government transfers themselves instead of passing them through to consumers in the form of lower tariffs.² In some cases, while in reality subsidies benefit the wealthy, a lack of information, or its unavailability to the public, may allow the perception to persist that subsidies benefit the poor.

The monopolistic cost structure of networked WSS services makes cost-reflective pricing difficult, which leads to significant subsidization. Networked services exhibit, in particular, declining marginal costs and increasing returns to scale due to large fixed costs, long-lived assets, and shared costs that are typically distributed across many consumers. High fixed costs make efficient pricing using marginal costs difficult, and such pricing would not allow for full cost recovery anyway (since the marginal cost of service provision is lower than the average cost). Around the world, there are heated debates on how to implement tariffs close to the marginal costs while ensuring that costs are recovered and that utilities remain financially viable. In practice, this often encourages

across-the-board subsidization of services. This explains the prevalence of significant state subsidies to fund the provision of piped water in low-income countries and member countries of the Organisation for Economic Co-operation and Development alike (Komives et al. 2005: 22). Even as costs may vary across consumers, often differentiated by geographic location, a high proportion of costs are shared. This gives providers a large degree of discretion in setting pricing structures, which is often exploited to advance political agendas.

In the short to medium term, utilities may be able to function with a pricing structure that does not cover the full costs of capital, and neglects the maintenance of assets. Around 65 percent of the cost of supplying piped water, and 80 percent of the cost of sewerage systems, is for long-lived capital assets that degrade over decades while maintaining functionality (for an average of 20-40 years in the case of water, and 40-60 years for sewerage; Komives et al. 2005). If service is to be sustained, future generations will need to pay for the gap left by earlier tariffs, either through increased taxes or tariffs, thus resulting in an intergenerational subsidy.

Taken all together, the cost structure of networked and sewerage service provision means that politicians and other government officials, as well as utilities' managers and staff, can allocate costs and subsidies based on political or private objectives, instead of economic and social objectives. This has severe consequences for the long-term sustainability of water and sanitation service provision, leads to inefficient use of scarce public resources, and often leaves the poor and marginalized behind.

2.2 Subsidies Are Expensive

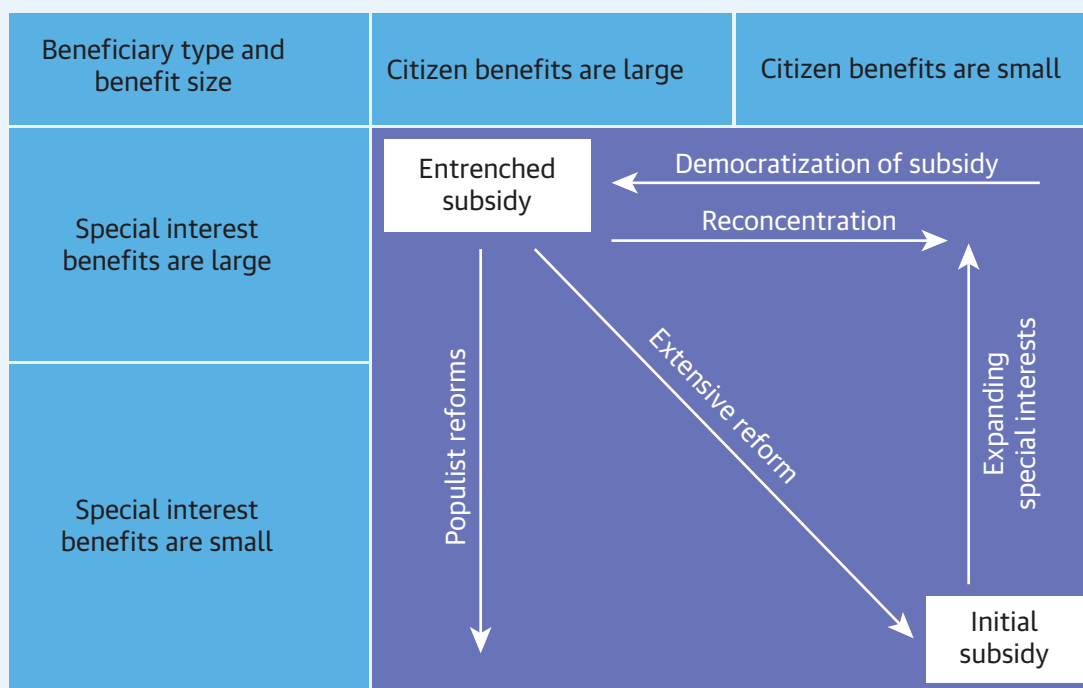
Not only are WSS subsidies pervasive across all countries, regardless of their income status, but they also tend to consume a substantial amount of a country's

BOX 2.2. Why Are Time-Bound Subsidies Rarely That?

Water supply and sanitation subsidies have a tendency to persist even when originally intended to be temporary. To better understand why this is the case, figure B2.2.1 depicts the basic life cycle of a subsidy regime as seen through a political economy lens. Subsidies may begin with modest purposes and at modest levels, as shown in the lower-right corner of the figure. In such a case, well-organized interest groups may realize that scaling up these levels would be to their advantage. As a result, the subsidy regime moves upward to the upper-right corner.

Although standard political economy models would predict that a subsidy with large special interest benefits and small citizen benefits would have a stable outcome—an iconic example of special interest politics—there are many examples of subsidies that have become democratized as special interests realize the potential benefits. Political leaders—often goaded by the opposition or animated by fears of losing power—also recognize the benefits of providing a broad-based subsidy. The subsidy regime thus shifts left and becomes deeply entrenched. These are the most difficult cases for reformers because they have the highest costs and are animated by political forces—leaders who fear the loss of broad-based public support, and organized special interest groups that oppose any reduction.

FIGURE B2.2.1. Life Cycle of a Subsidy Regime



Source: Adapted from Inchauste, Victor, and Schiffer (2018).

scarce public resources. A discussion of their magnitude requires us to briefly introduce the types of costs associated with WSS service provision.

The Costs of WSS Service Provision

Since subsidies are the difference between (i) the costs of service provision and (ii) the amount paid by users, defining and estimating the first element of the equation is fundamental to any analysis. When computing the costs of service provision, total economic costs (and, eventually, inefficiencies, or slack³) are taken into account.⁴ These include O&M costs, depreciation, taxes, a fair and reasonable return on capital expenditure, and also environmental costs. Figure 2.1 outlines these costs, along with some examples.

Costs of Service at an Aggregate Level

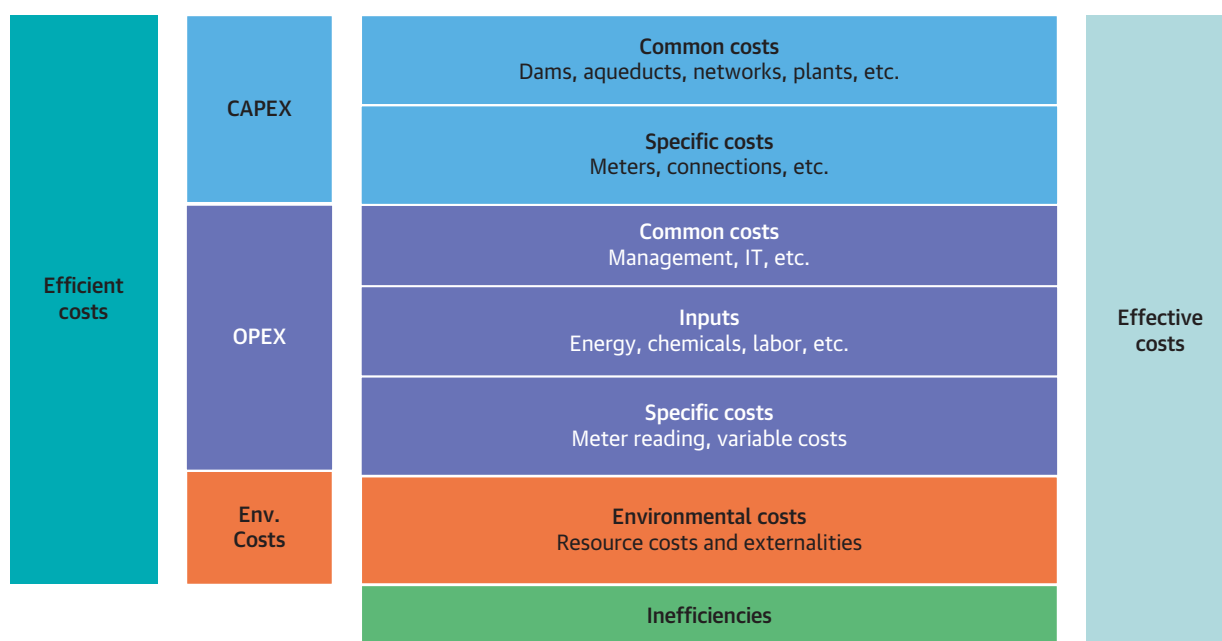
The costs of service at the aggregate level can be expressed as the revenue required to cover the incurred

(economic) costs. In accounting terms, these costs include operating costs, debt interest and amortization, depreciation, return of capital, return on equity, and taxes (see box 2.3). Beyond these, all service providers present some inefficiencies that result in additional, hidden, costs that should be taken into account.⁵ An efficient level of regulation is assumed, which means that tariffs cannot be higher than the economic costs of service. If there are benefits above the opportunity costs of capital, then users are, in effect, subsidizing the service provider.

The Magnitude of Networked Water and Sanitation Subsidies

Subsidies tend to be heavily biased toward networked water and sewerage sanitation service provision. As an example, the 2017 Global Analysis and Assessment of Sanitation and Water (GLAAS) report found that, in 13 countries, urban WSS expenditure accounted for

FIGURE 2.1. Costs of Water and Sanitation Service Provision



Source: Authors' compilation.

Note: CAPEX = capital expenditure; IT = information technology; OPEX = operating expenditure.

BOX 2.3. Various Ways to Calculate Cost-Recovery Levels

To set cost-recovery tariffs, it is necessary to first calculate the costs of providing service.

WSS services are funded by a mixture of revenues from the so-called three Ts: tariffs, taxes, and transfers (OECD 2009). Cost-recovery tariffs may be estimated as the total costs of service provision (i.e., including the depreciation and the profitability of the total capital employed), or some selected portions of these. Any costs not recovered through tariffs must be covered through a combination of taxes and transfers. Common methods of calculating cost-recovery tariffs are summarized in table B2.3.1.

TABLE B2.3.1. Alternative Methods for Estimating Cost-Recovery Tariffs

Focus of analysis	Definition	Impact
Operation and maintenance (O&M) costs.	Most basic definition of costs that can be adopted.	When the utility's income does not cover O&M, each additional unit of sale produces losses.
Financial costs (which include operating expenses and interest and amortization of third-party capital, or debt).	Financial sustainability criteria. Relevant from the point of view of a lender.	By not covering the amortization of its own capital the utility loses productive capacity.
Financial costs and capital maintenance (depreciation of equity).	Revenues allow a company to maintain its productive capacity.	Not recognizing the opportunity cost of its own funds, the utility does not generate investment incentives.
Service's economic costs.	Totality of economic costs.	The system is economically sustainable.

Each of these various methods can be found in various analyses of the WSS sector. In some cases, government plans explicitly provide for the use of one method for determining the fees that users must pay. However, since the difference between revenue and the totality of economic costs constitutes a subsidy, any definition of cost recovery that does not cover the total economic cost should be interpreted as a level of subsidy.

Source: Authors' compilation.

76 percent of public WSS expenditure, and that globally, official development assistance of “large systems” (including large urban distribution networks and/or treatment facilities) accounted for three-quarters of all official development assistance to the WSS sector in 2015, which amounted to approximately \$5.6 billion of the \$7.4 billion flowing into the sector (WHO 2017). Given the pronounced bias of funding toward networked WSS services, a trend that likely holds true for subsidies as well, and the paucity of data on subsidies for decentralized,

nonnetworked water and on-site sanitation services, our estimation focuses on networked water and sewer sanitation services.

Estimating subsidy levels for networked services at the global level is a daunting task. Subsidies may be explicit or implicit, and come in a wide variety of shapes and sizes. Utility-level data on costs are generally either not available or highly unreliable. Given the data limitations, an estimation of the costs of providing WSS services efficiently across service providers requires a simple methodology

that makes use of only the most commonly available variables.

Superintendencia de Servicios Sanitarios (SISS), the Chilean water regulator, has developed an effective methodology for estimating the tariffs of all utilities in the country. Its use of an efficient (optimized) bottom-up model⁶ provides valuable information on the greenfield capital investment⁷ needed for the provision of WSS services that, for the purposes of the present study, we extrapolate to utilities in other countries. It is important to note that our methodology does not seek to benchmark these utilities against Chilean utilities. Instead, our decision to use the efficient model developed by the Chilean regulator is predicated on its sophisticated and novel framework for estimating costs and measuring performance.⁸

To compute an efficient WSS tariff for each utility with sufficient data for the period 2010–15 in the World Bank’s IBNET database, we develop a methodology that complements utility-specific data with estimates of the long-term incremental costs of efficient model utilities, as determined by the Chilean regulator.⁹ We then adjust this tariff to account for the relative losses and labor inefficiencies of each utility to obtain a full tariff, which allows a return compatible with a utility’s economic opportunity cost of capital (i.e., to be economically sustainable). The subsidies for each firm can then be computed as the difference between this cost-reflective full tariff and the effective tariff that a utility charges.¹⁰

In order to obtain countrywide subsidy amounts for those countries with partial representation in the IBNET database, we extrapolate the results of those utilities that are listed in IBNET to the rest of the country, on the basis of 2015 WSS coverage rates estimated by the Joint Monitoring Programme¹¹ and population data from the World Bank. Average per capita subsidy figures were then obtained for each of the World

Bank’s four country classifications—high income, upper middle income, lower middle income, and low income—allowing us to extrapolate to the remaining countries based upon their estimated coverage rates of piped water and sanitation services.

This method estimates the magnitude of subsidies associated with the operations, maintenance, and replacement of existing infrastructure, taking into account each utility’s particular levels of inefficiency. For our purposes, operating expenditure (OPEX) includes that required for the utility to provide services at current levels of efficiency and quality, as well as for regular maintenance. Capital expenditure (CAPEX) includes that required for the major repair and/or replacement of existing infrastructure, spread out equally across an assumed 35 year design life of each asset.

It is important to note that our estimation does not include CAPEX for infrastructure expansion or environmental costs. Since infrastructure expansion tends to be fully subsidized, the actual global magnitude of networked water and sanitation subsidies is much greater than our estimation. Environmental costs, which include any ecosystem degradation and depletion caused by either water abstraction or the resulting emission of pollutants, as well as the opportunity costs of using a resource, must be taken into account in any policy decision. Since the magnitude of these costs will vary greatly from utility to utility on the basis of a variety of technological, environmental, and societal factors, calculating an estimate of global environmental costs associated with networked water and sewerage sanitation services is not currently feasible and is beyond the scope of this report. However, these costs should be assessed on a case-by-case basis through a thorough environmental impact assessment.

Because of a lack of data, China and India are both excluded from our estimations. Proportional to the

size and number of their utilities, both countries have very little representation in IBNET; this, coupled with a lack of data from other sources, prevents us from accurately extrapolating subsidies at the country level. As discussed in box 2.4, the estimates of global water and sanitation subsidies put forward in Kochhar et al. (2015) include both China and India, using a comparable price gap approach. But we have decided not to include these numbers in our global estimates since they are based on significant assumptions, different from those undertaken in our approach, that would reduce reliability.

Using our method, as outlined above, the global subsidy level was estimated at \$289–\$353 billion per year, or 0.46–0.56 percent of the countries' combined gross domestic product (GDP). As a percentage of GDP, this figure rises, shockingly, to 1.59–1.95 percent if only low- and middle-income economies are considered, an amount largely due to the capital subsidies captured in our estimation. These figures are in line with previous estimates from the literature (see box 2.4).

Table 2.2 disaggregates subsidies for CAPEX and OPEX across World Bank regions.

Subsidies of operating costs account for approximately 22 percent of the total subsidy amount both in the full sample and for low- and middle-income economies separately.

While our overall estimation is in line with existing literature, most studies systematically underestimate CAPEX subsidies (e.g., no adjustments to the asset base or cost of capital are applied). With its inclusion of full cost-reflective tariffs, our approach is thus a better way to estimate hidden costs.

At around \$101–124 billion per year, Latin America and the Caribbean exhibits the largest amount of subsidy both in absolute terms and as a percentage of GDP (including both operating and capital subsidies). It should be noted, however, that if China were included in our analysis, the East Asia and Pacific region's total amount of subsidies would be substantially higher. Previous estimates (see Kochhar et al. 2015) that

The global subsidy level was estimated at \$289–\$353 billion per year.

TABLE 2.2. OPEX and CAPEX Subsidies, by Region (2017 \$ and Average % GDP)

Region	OPEX Subsidy (\$ billion)	CAPEX Subsidy (\$ billion)	Total Subsidy (\$ billion)	OPEX Subsidy/GDP (%)	CAPEX Subsidy/GDP (%)	Total Subsidy/GDP (%)
<i>World Bank geographical regions*</i>						
Africa	4.1–5.1	17.2–21.1	21.4–26.1	0.24–0.30	1.03–1.25	1.28–1.56
East Asia and Pacific (without China)	5.0–6.2	18.0–22.0	23.1–28.2	0.22–0.26	0.78–0.96	1.00–1.22
Europe and Central Asia	13.1–16.0	45.6–55.8	58.7–71.8	0.33–0.41	1.16–1.42	1.48–1.81
Latin America and the Caribbean	23.4–28.6	77.8–95.1	101.2–123.7	0.45–0.55	1.51–1.85	1.96–2.40
Middle East and North Africa	10.2–12.5	37.6–46.0	47.9–58.5	0.35–0.43	1.31–1.61	1.66–2.03
South Asia (without India)	2.3–2.8	3.2–3.9	10.9–13.3	0.39–0.47	1.43–1.75	1.82–2.22
<i>Advanced and nonadvanced economies (as categorized by IMF)</i>						
Advanced economies	7.8–9.6	17.6–21.5	25.4–31.0	0.018–0.022	0.036–0.044	0.054–0.066
Nonadvanced economies	58.1–71.1	204.9–250.5	263.1–321.6	0.35–0.43	1.24–1.52	1.59–1.95
Total	66.0–80.7	222.5–271.9	288.5–352.6	0.11–0.13	0.35–0.43	0.46–0.56

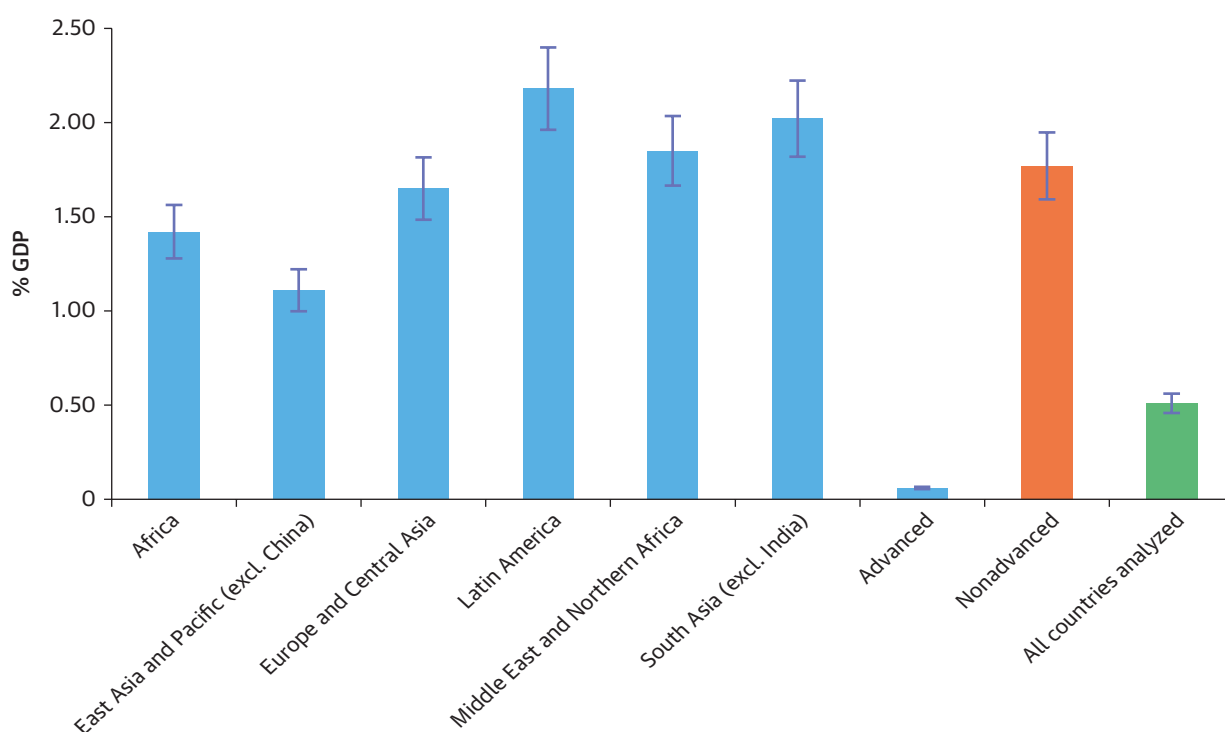
Source: Authors' compilation.

Note: * Regional estimates exclude "advanced economies," as categorized by the International Monetary Fund. CAPEX = capital expenditure; GDP = gross domestic product. IMF = International Monetary Fund; OPEX = operating expenditure. Estimates for East Asia and Pacific and nonadvanced economies exclude China, while estimates for South Asia exclude India. Estimates for nonadvanced economies exclude both China and India.

BOX 2.4. How Do Our Estimates Compare with Other Approaches?

The most directly comparable estimate of subsidies was conducted by Kochhar et al. (2015). This similarly follows a price gap approach by subtracting actual revenues from estimated costs. Instead of our model utility approach, however, the authors use a reference full cost-recovery price of \$1 per cubic meter, which is taken from work done by the Global Water Intelligence in 2004 (GWI 2004) and is assumed to be the same for drinking water and wastewater. They then adjust this price for each country to account for three factors: (i) general price inflation that occurred between 2004 and 2012; (ii) lower labor costs in low- and middle-income countries; and (iii) varying levels of water scarcity. Revenue is approximated using data on utility drinking water and wastewater tariffs for a sample of over 80 countries in 2012 from the GWI. The authors estimate that water and sanitation subsidies provided through public utilities were about \$456 billion, or 0.6 percent of global gross domestic product (GDP), in 2012. Across regions, subsidies range from between 0.3 percent and 1.8 percent of GDP. Note that these estimates include China and India, the former with an estimate of around \$130 billion, or about 1.5 percent of its GDP in 2012. Without China and India, this estimate becomes 0.5 percent of global GDP, or, adjusted for general price inflation from 2012 to 2017, \$347 billion. Both of these numbers fall within our estimation range.

FIGURE 2.2. Magnitude of WSS Subsidies, by Region



Source: Authors' compilation.

Note: GDP = gross domestic product. Bars indicate the midpoint of the estimation range, while the black brackets represent the full estimation range. World Bank regional estimates exclude countries classified as advanced economies by the IMF. Advanced and nonadvanced countries refer to these IMF classifications. Estimates for East Asia and Pacific and nonadvanced economies exclude China, while estimates for South Asia exclude India. Estimates for nonadvanced economies exclude both China and India.

used the price gap approach and included China attributed the largest subsidies in nominal terms to Asia, at over \$190 billion per year, of which 60 percent was in China alone (see box 2.4). Figure 2.2 displays the magnitude of subsidization as a percent of GDP by region.

Annual subsidies relative to GDP within regions range from 0.05 percent up to 2.40 percent. The lowest rates are clustered in advanced economies (as classified by the International Monetary Fund) and the highest in Latin America. In figure 2.2, advanced economies were removed from their respective regions. If this had not been done, values for these regions would have been lower.

These results are in line with previous estimates: most high-income countries tend to charge water tariffs close to the level required to cover operating expenditures and asset depreciation, as well as maintain infrastructure. On the other hand, water tariffs far from cost recovery are most often found in low- and middle-income countries. Utilities in Sub-Saharan Africa, for example, usually operate at a loss and end up lowering their capital expenditures to continue operating, which ultimately leads to a decline in service quality.

Subsidies of networked water far exceed those for sewerage globally, accounting for 64 percent of the total subsidy amount. Overall, advanced economies allocate a higher percentage of subsidies toward sewerage than do nonadvanced economies (44 percent). Sub-Saharan Africa and East Asia and Pacific allocate the lowest proportion (6 percent and 11 percent, respectively). These differences are largely due to the higher rates of access to networked water than to sewerage globally, and the varied rates of access to sewerage across regions.

While our estimates of subsidies for OPEX are relatively straightforward—they predominantly represent explicit expenditures required to sustain service

provision at current levels of efficiency and quality—our estimates of subsidies for CAPEX require additional nuance. Because of a lack of data on most countries' direct expenditure on networked water and sewerage sanitation, our model instead estimates the CAPEX required for the replacement of existing infrastructure. However, there have been several recent attempts to extrapolate direct expenditure from countries with more comprehensive and transparent expenditure data to regional, and even global, levels of expenditure.

Prior estimations of global and regional direct CAPEX on WSS services in low- and middle-income countries, making use of data available from a limited number of countries, are between 0.4 and 0.5 percent of GDP. Fay et al. (2017) have found that the WSS sector has traditionally received a small share of Latin America and the Caribbean's investments in infrastructure, hovering between a quarter and a third of a percent of GDP in the period 2000–12. Data from Foster and Briceño-Garmendia (2010) suggest that Africa spends around 0.5 percent of GDP, while Andres, Biller, and Dappe (2013) estimate that South Asia spent an average of 0.41 percent of its GDP in the period 2000–11. A more recent, and global, estimation of subsidies in the WSS sector can be inferred from Fay et al. (2019), who estimate infrastructure investments in low- and middle-income countries. Their report does not directly disaggregate CAPEX by sector. However, evidence from BOOST allows the authors to investigate the evolution of public infrastructure spending by sector over the period 2009–16. During this time, infrastructure spending in the WSS sector began at about 0.3 percent of global GDP, climbing to a peak of about 0.6 percent in 2012, before falling back to 0.3 percent. The average expenditure for this period was around 0.4 percent of global GDP.

When combined with our estimates for OPEX, the use of the limited direct CAPEX data available results in

total networked water and sewerage sanitation subsidies in low- and middle-income countries in the range of 0.75-0.95 percent of GDP. While these estimates are below our estimate of 1.59-1.95 percent of GDP for low- and middle-income countries, such discrepancy is not unexpected given key differences between the two approaches followed.

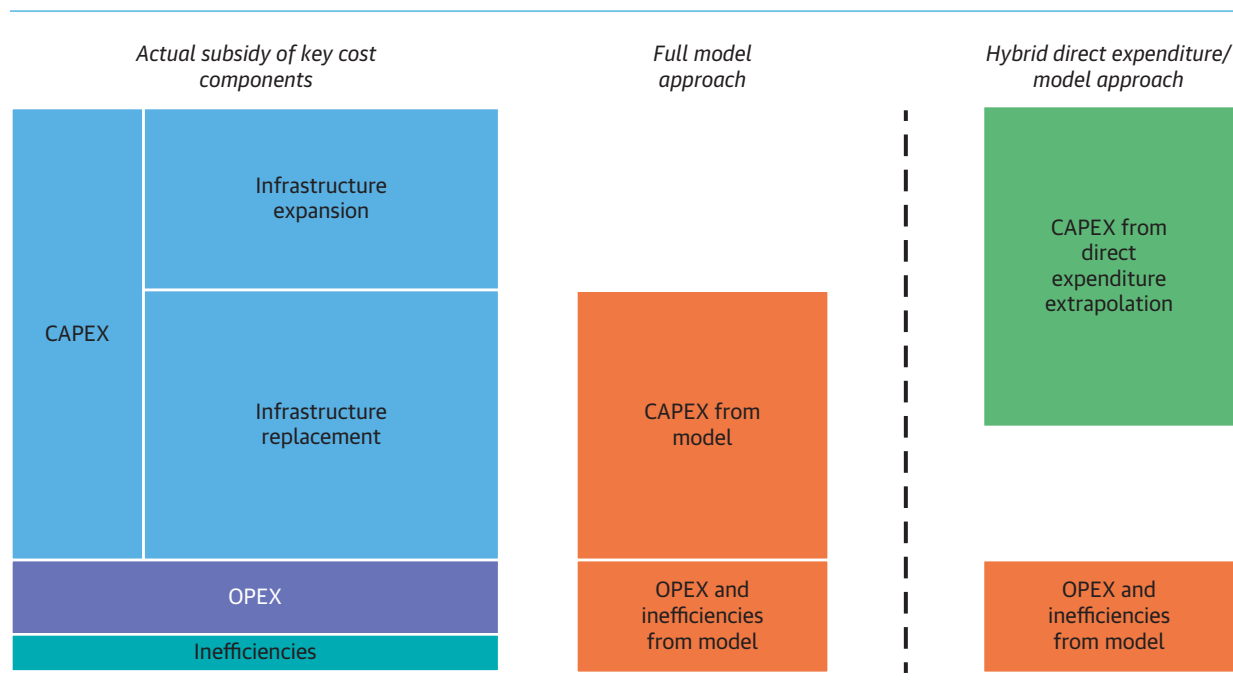
First, the use of direct expenditure significantly underestimates the CAPEX subsidies provided to the sector for existing infrastructure due to the deferral of maintenance—a phenomenon especially common in low- and middle-income countries. It has been well-documented that low- and middle-income countries in particular struggle with revenue collection and limited fiscal capacity, and are thus prone to significant deferrals of maintenance, as well as major repairs and replacement of existing infrastructure. Yet, even if these expenditures are not currently being made—either through taxes, transfers, or

tariffs—they will need to be covered by future generations to maintain existing WSS services over time. Since our model allocates such expenditure in equal installments across the design life of the asset, its estimates are significantly higher by reflecting these intergenerational subsidies.

Second, while our model accounts for the full costs of required major repairs and replacement of existing infrastructure, it does not account for expenditures towards infrastructure expansion. In a steady-state situation whereby infrastructure expansion is limited, both estimates should be reasonably similar since actual direct CAPEX would be exclusively and comprehensively covering the maintenance and replacement of existing infrastructure. These key differences between the two models are depicted in figure 2.3.

Finally, it is worth mentioning that these estimates are global, and therefore represent regional and global average levels of subsidies in the WSS sector.

FIGURE 2.3. Estimating the Magnitude of Subsidies: Two Approaches



Source: Authors' compilation.

Note: CAPEX = capital expenditure; OPEX = operating expenditure. The full model approach estimates CAPEX, OPEX, and inefficiencies using our model, which complements utility-specific data with estimates of the long-term incremental costs of efficient model utilities. The hybrid direct expenditure/ model approach, meanwhile, substitutes direct expenditure data in the place of the CAPEX model estimates, while maintaining the model's estimates for OPEX and inefficiencies.

Estimates at the country level may differ significantly from these ranges due to the many contextual factors that vary across countries. The estimation of subsidies at the country level would therefore require additional data and a refined methodology.

Impact on the Broader Economy

The large magnitude of subsidies imposes a fiscal burden on the government budget that can adversely impact the broader economy. These budgetary transfers practically become recurrent expenses that the government has little control over, thus reducing its available fiscal space to address other spending priorities. Moreover, the recurrent expenses, if large, may affect the government's ability to adopt fiscal stabilization measures during times of economic slowdown. As access to subsidized services increase, so does the magnitude of the transfers, further eroding the government's fiscal stability and debt sustainability.

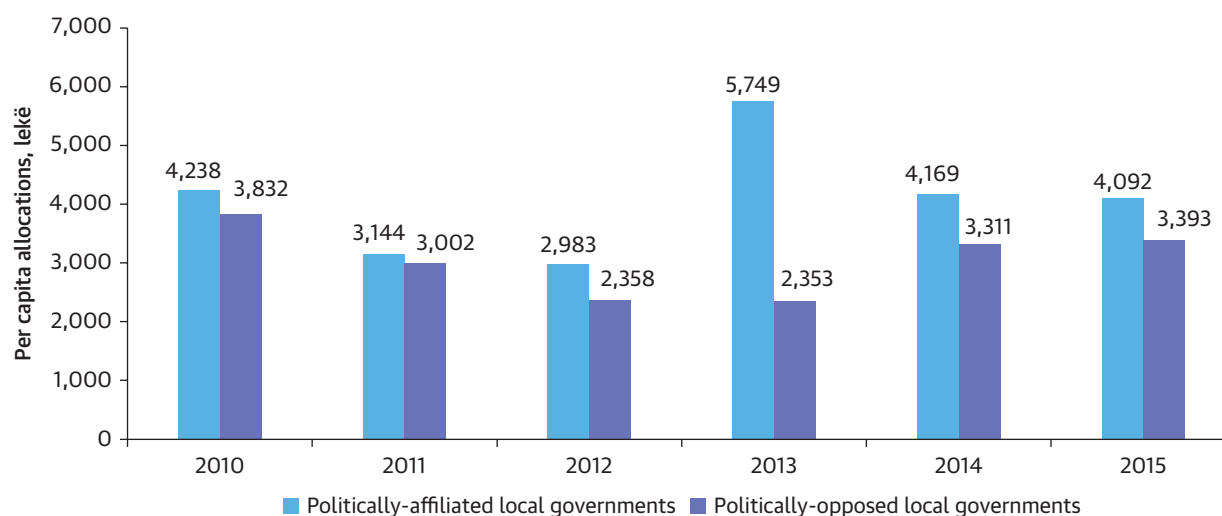
2.3 Most Subsidies Are Poorly Targeted

Given that a primary objective of WSS subsidies is to advance equitable access to affordable WSS services, it

is important to ensure that these resources are well targeted to poor households. The 2030 Agenda for Sustainable Development recognizes the importance of effective targeting in ensuring that no one will be left behind as a country's socioeconomic development advances. This development includes, importantly, access to WSS services (WWAP 2019).

Before discussing the distributional performance of consumption subsidies and subsidies of initial costs and connection charges, it is important to note that poor targeting is not always related to inadequate subsidy design; the targeting of subsidies is also prone to political interference. In most countries, both economic and political efficiency considerations influence decisions regarding subsidies. Government expenditure on infrastructure is not allocated only based upon need, but sometimes to advance political agendas by favoring particular groups. In other words, subsidies may not be well targeted from the standpoint of benefiting the poor, yet they are well targeted from the perspective of politicians. A recent analysis by the World Bank's BOOST initiative provides evidence from Albania on the prevalence of

FIGURE 2.4. Politically Motivated Allocation of Capital Grants for Infrastructure in Albania



Source: World Bank's BOOST initiative.

such favoritism in the financing of local infrastructure, including for WSS services. As shown in figure 2.4, local governments where the mayor is politically affiliated with the national government get significantly higher capital grant allocations on a per capita basis. This correlation persists even when controlling for socioeconomic variables, such as regional poverty rates.

Distributional Performance of Consumption Subsidies

Since the 2000s, a growing number of studies have found that water consumption subsidies¹² for the poor in low- and middle-income countries are usually badly targeted due to many interrelated factors: (i) poor households tend to reside in areas where there is no access to water networks; (ii) poor households are not connected to a network, even when residing in areas with access; and (iii) correlation between piped water use and income is low (Fuente and Bartram 2018), meaning that subsidies delivered through the lower blocks of IBTs are poorly targeted (see box 2.1). Key examples of this literature—such as Komives et al. (2005), Angel-Urdinola and Wodon (2011), and Fuente et al. (2016)—have shown that quantity-based, targeted subsidies in Cape Verde, Nicaragua, Sri Lanka, and the cities of Bangalore (India), Kathmandu (Nepal), and Nairobi (Kenya) are regressive, with a

smaller share of benefits accruing to the poor than the general population. These studies indicate that ineffective targeting is mostly associated with poor neighborhoods' low rates of access to water networks; also, even in neighborhoods with such access, poor households

have low connection rates. More recently, the World Bank Group (2017b) found that Tunisian households in the bottom quintile of the distribution receive 11 percent of water subsidies, while those in the top quintile receive 27 percent.

Building on the methods of Komives et al. (2005) and Angel-Urdinola and Wodon (2011), we provide new evidence on the targeting performance of piped-water consumption subsidies in 10 countries: Ethiopia, Mali, Niger, Nigeria, Uganda, El Salvador, Jamaica, Panama, Bangladesh, and Vietnam.¹³ The analysis utilizes household survey data and utility providers' administrative data as well as new estimates of country-specific cost-reflective tariffs.¹⁴ Most of these countries have IBT structures. Only Nigeria and Uganda have fixed rates: the average unit prices charged are on average lower than the cost of producing and distributing piped water, resulting in substantial subsidies.

In the 10 countries we analyzed, an average of 56 percent of subsidies reach the wealthiest quintile of a country's population, while a mere 6 percent reach the poorest quintile. As shown in figure 2.5, in all 10 countries analyzed, subsidies are regressive, with the amount of resources allocated to water consumption subsidies increasing over the expenditure distribution. To identify this, we first classify all households within each country into deciles, according to their places in the countrywide wealth distribution. We then calculate the percentage of money spent on subsidies accruing to all households in a given decile. Richer households in the top five deciles usually capture the lion's share (although as box 2.5 describes, those resources that do accrue to the poor represent a substantial part of their consumption expenditure). In addition, we present the share of total expenditure in the economy accruing to each expenditure decile, to show if the subsidy has a redistributive effect by reducing inequality

An average of 56 percent of subsidies reach the wealthiest quintile of a country's population, while a mere 6 percent reach the poorest quintile.

FIGURE 2.5. The Percentage of (a) Water and Sanitation Subsidies and (b) Total Economic Expenditure that Accrue to Population Segments, Organized by Wealth Distribution (Decile), in 10 Countries

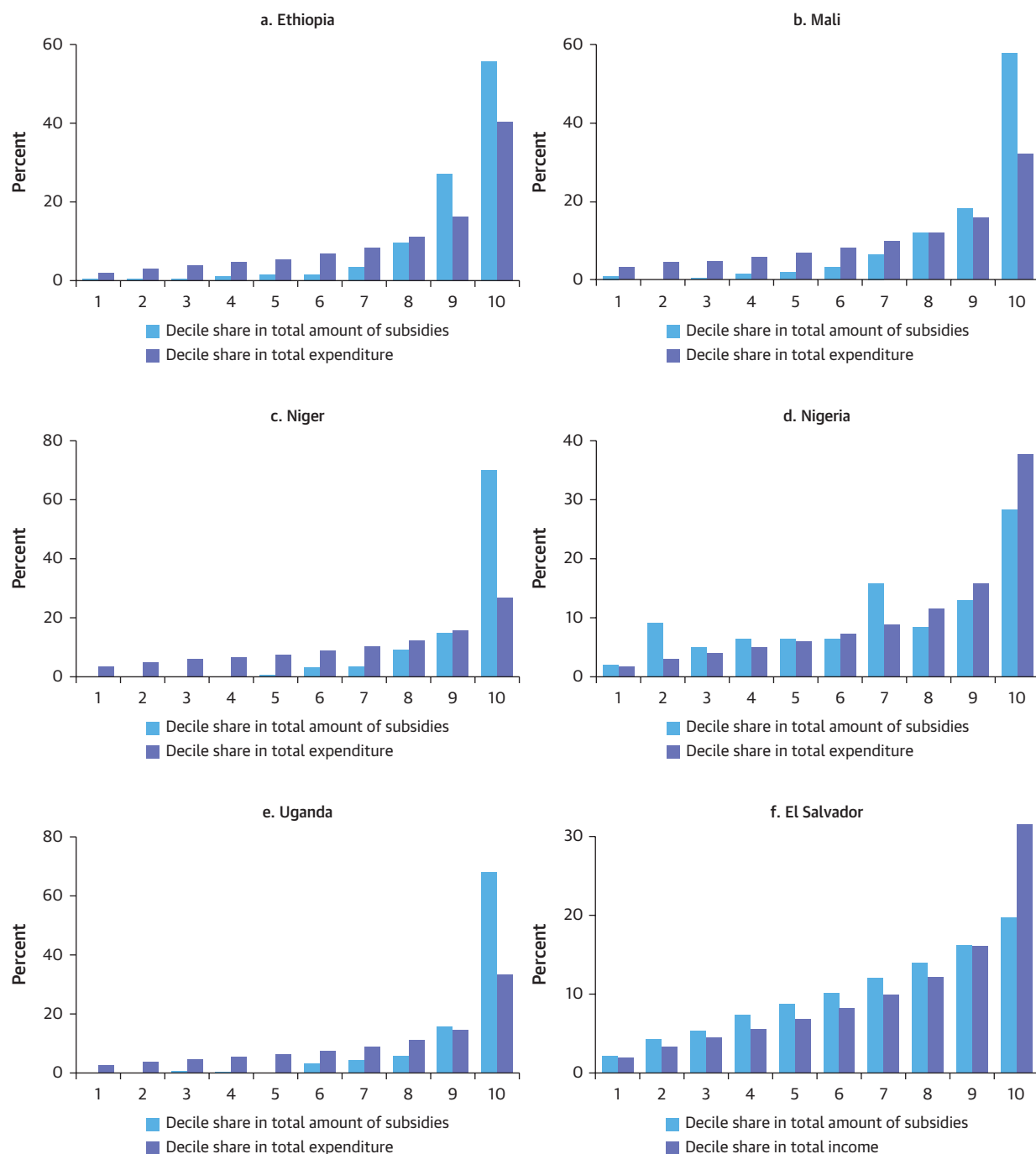
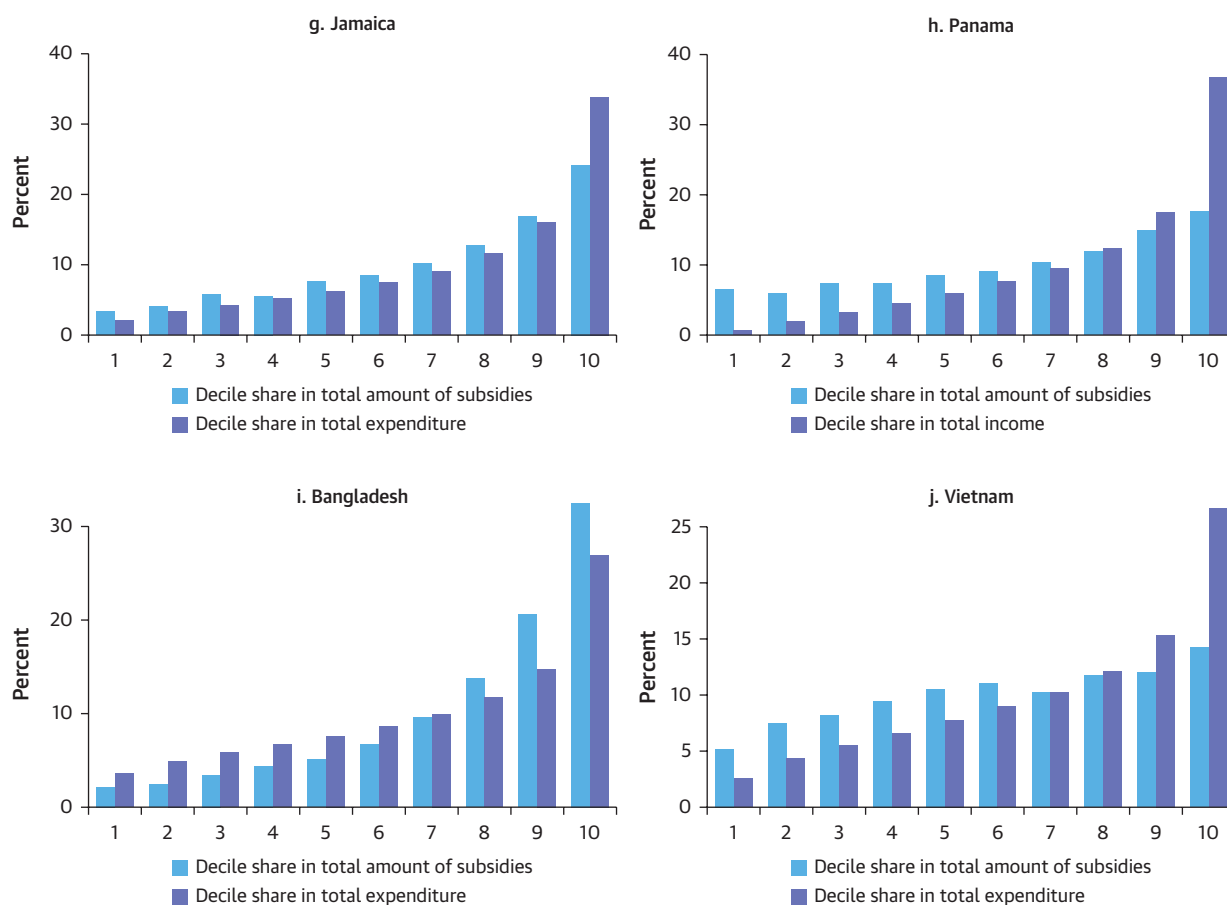


figure continues next page

FIGURE 2.5. continued



Source: Authors' own compilation based on household surveys, administrative data, and cost-reflective tariff data.

Note: All figures are calculated using sample weights. Total expenditure is total household expenditure in all categories. The distribution of expenditure (all countries except El Salvador and Panama) or income (El Salvador and Panama) refers to the countrywide distribution of expenditure per capita, that is, households are ranked according to their expenditure per capita.

(i.e., if the share of subsidy is less concentrated in the top deciles than the expenditure distribution). Although subsidies across all 10 countries are regressive, we find that in half of the cases, they do, in fact, reduce inequality¹⁵ (El Salvador, Jamaica, Nigeria, Panama, and Vietnam).

An analysis of how well consumption subsidies target their intended beneficiaries in 10 countries suggests that poor performance does not arise primarily from the subsidy design, but from two factors related to access. First, most WSS subsidies focus on

networked services even though the poorest communities are typically in areas not serviced by networks. Second, even where poor households *could* connect to a network, many do not do so because they cannot afford the connection and/or consumption charges.¹⁶ The result is that many rich households are included in the subsidy pool, while even more poor households are excluded (see table 2.3). This issue is particularly pronounced in the five African countries analyzed, where errors of inclusion and exclusion fall between 90 and 100 percent,

BOX 2.5. Materiality of Subsidies for the Poor: Networked Water Services in Ten Countries

It should be emphasized that subsidies are in fact quite important to the poor since they represent a substantial part of the poor's consumption expenditure. In order to better understand the impact that subsidies have on poor households that receive them, we constructed a measure of materiality as part of our analysis of the targeting performance of networked water subsidies in the 10 countries analyzed. The materiality of a subsidy is defined as the value of the subsidy for a given recipient household as a share of that household's total expenditure.

According to this analysis, materiality varies significantly across the 10 analyzed countries: from a high of 100 percent in Mali to a low of 5 percent in Uganda. In Ethiopia and Panama, subsidies constitute about 60 percent and 50 percent, respectively, of the consumption expenditure of the poorest decile. These results imply that, in many countries, subsidies are critical to ensuring consumption of networked water among those poor households that have access to the service. Yet only a small proportion of the poorest households have access to networked water services in these countries, due primarily to factors related to access. Therefore, with improved targeting, subsidies have great potential both to advance poor households' access to networked water services (and, we might extrapolate, to sewerage sanitation services) and to reduce poverty.

Source: Authors' compilation.

TABLE 2.3. Water Consumption Subsidies: Errors of Inclusion and Exclusion in 10 Countries

	Error of inclusion (%)	Error of exclusion (%)
Ethiopia	96.0	97.6
Mali	97.8	99.2
Niger	99.7	99.9
Nigeria	74.4	89.6
Uganda	98.3	99.6
El Salvador	82.0	78.3
Jamaica	77.6	53.1
Panama	71.1	38.6
Bangladesh	87.7	95.5
Vietnam	66.5	50.3

Source: Authors' own calculations using country-specific household surveys, administrative data, and estimated cost-reflective tariffs.

Note: Poor households are defined as belonging to the first four deciles of the expenditure (or income) distribution in each country. Error of inclusion is measured by the percentage of all beneficiary households that are rich; error of exclusion is measured by the percentage of poor households that do not get a subsidy. All figures are calculated using sample weights.

with the exception of Nigeria's 74 percent error of inclusion. It should be noted, however, that subsidy design improvements could also be beneficial, as subsidy design factors (i.e., the subsidy's type or structure) on their own tend toward a neutral targeting performance. (See box 2.1 near the beginning of this chapter for more on how both access- and design-related factors explain the inefficacy of IBTs across different contexts.)

Distributional Performance of Subsidies of Initial Costs and Connection Charges

Where households have limited access to service, subsidizing the initial costs of gaining access generally benefit the poor. This is because, in many cases, a lack of access to WSS services is a good proxy for poverty.¹⁷ Therefore, even without targeting a specific customer group, subsidies of initial costs and connection charges often prove progressive since, by definition,

TABLE 2.4. An Overview of Connection Subsidies

	Untargeted subsidies	Targeted subsidies		
		Implicit targeting	Explicit targeting	
			Self-selection	Administrative selection
Mechanism	No connection fee* Subsidized interest rate for financing connections	Flat connection fee for unmetered connections, subsidizing high-volume consumers	Reduced connection fee for households that provide their own labor/materials or opt for a lower service level	"Social connections"
Beneficiaries	All new customers	New connections that cost more than the average to connect due to technical complications	Households that provide their own labor or opt for a given service level	Households classified as poor or within designated geographic areas

Source: Simplified version of Komives et al. (2005).

Note: *That a connection charge is missing or discounted does not necessarily imply that a subsidy is in place, since a utility can recover connection costs by billing customers a recurring fixed charge.

they are available only to unconnected or unserved households. Table 2.4 categorizes several examples of connection subsidies and lists their beneficiaries.

It is important to note, however, that in the case of networked water and sewerage services, a given household's ability to gain access is predicated on location. Thus, related infrastructure must be available within poor neighborhoods for connection subsidies of networked/sewered services to effectively reach the poor.

Meanwhile, not all households eligible to receive a connection subsidy will ultimately decide to connect. Apart from the connection charge, when deciding whether or not to connect, households will consider the quality and reliability of water or sanitation services, the recurrent tariffs or fees that they will have to pay, and the cost and quality of possible alternatives. They will also consider the costs of necessary in-house upgrades required to fully enjoy the benefits of the networked/sewered service. These upgrades are particularly relevant in the case of sanitation services, and may cost more than the connection charge itself.

Another issue to consider is that access subsidies do not always benefit the consumer, but may instead

benefit the land or facility owner. In the case of rented residences, if a connection subsidy is provided, the main beneficiary will be the homeowner, through the consequent increase in property value (and, possibly, monthly rent charges).

Thus, when assessing the effectiveness of access subsidies in reaching the poor, it is necessary to not only know the number of people without access but also the reasons why. As pointed out by Komives et al. (2005), underlying factors will vary from place to place, with implications for the effectiveness of subsidies.

2.4 Most Subsidies Are Not Transparent

Given the challenges of estimating the full costs of WSS service provision (as discussed above), the actual magnitude of subsidies in the sector is rarely known to governments, regulators, or citizens. Without even an estimate of this magnitude, policy makers are unable to make informed decisions on subsidy design and allocation. And since a utility possesses more information about its cost structure and level of efficiency than any regulator, the lack of transparency is difficult to overcome. This so-called informational asymmetry gives the utility a bargaining advantage that can lead to inadequate services, inflated costs, or both.

Evidence suggests that citizens are often unaware of or do not understand how expensive and inefficient current subsidies may be. Consequently, it is often difficult to gain public support for reform efforts that would result in increased tariffs both because the public may perceive current tariffs to be cost-reflective (and thus water production to be relatively inexpensive) and because of a lack of awareness of the adverse implications of the current subsidy (Gallaher, Alam, and Rouchdy 2017).

Such information asymmetry and lack of transparency in cost structures, coupled with difficulty in monitoring maintenance needs and service provider performance, may render service providers unaccountable for the use of scarce public resources as they fail to benefit customers through improved service quality and/or reduced costs. A particularly opaque method of subsidization is general financial support to the service provider (through transfers to cover operational expenditures, direct funding of capital assets, tax exemptions, subsidized prices for inputs, loan guarantees, and so on). The government entity providing the subsidy *hopes* that the service provider will pass it on to consumers in the form of improved services at lower costs. But since the service provider is responsible for allocating the subsidy, much of the financial support may end up being captured by the provider's management and employees instead of going toward the maintenance required to sustain or improve the level of service. The customers, meanwhile, may scarcely benefit from the subsidy, whether in the form of improved service quality or reduced costs, and may even see service quality deteriorate as maintenance is neglected.

A related problem is so-called regulatory capture, which occurs when the regulator colludes with utilities at the expense of taxpayers.¹⁸ Where institutional capacity is limited and corruption common, securing the regulator's independence from both the water

ministry and utility companies (public or private) has been a focus of water sector reforms (Le Blanc 2008). The reason why collusive arrangements persist can be explained by (i) administrative simplicity, as subsidies given to suppliers are “one-off;”

the use of these funds are fungible and generally undocumented, and the benefits are supposed to trickle down to consumers; and (ii) corruption among government officials and suppliers, spurred by a lack of transparency.

The influence over policy decisions possessed by professionals in the field, a power known as professional dominance, jeopardizes the effective governance of subsidies. Given the technical and specialized nature of their work, WSS engineers have credentials and a set of technical skills that give them a degree of autonomy, power, and dominance in the market. These enable them to influence key features of service delivery, including investment priorities, the organization of supply, and standards of service, all of which directly affect the size and type of subsidies in the sector (McLoughlin and Batley 2012). Professional dominance can also directly promote information asymmetry, leading to reduced upward accountability to government or regulators, and reduced downward accountability to citizens. Water sector professionals and providers might even have an incentive to “exclude competitors, manipulate prices, or oppose reform,” which promotes ineffective subsidies to the detriment of more pro-poor and affordable services (Mason, Harris, and Batley 2013). There is some indication that such rent-seeking behavior is more prevalent where private providers grow large and establish monopoly power.¹⁹

Citizens are often unaware of or do not understand how expensive and inefficient current subsidies may be.

It is challenging to administer subsidies in contexts where several levels of government oversee the WSS sector, as is common in most countries. Shared oversight, coupled with asymmetric access to information between the subnational and central levels of government, can lead to several difficulties. Local needs are difficult for central authorities to observe and estimate, and this may result in suboptimal levels of investment.²⁰ Also, administrative complexity can provide cover for rent-seeking. For example, central authorities may deliberately foster opacity in intergovernmental allocations and the timing of transfers, in some cases influenced by patronage politics at the local level.

Governments can exploit subsidies to advance their political agendas, by manipulating cost allocations and showing preference for certain demographic groups or geographic areas. Section 2.3, for example, presents evidence on how Albanian politicians show preference for politically affiliated local governments in capital grant allocations. In other settings, subsidies targeting primarily middle- and high-income households might appeal to politicians if these groups are more likely to vote in elections and/or influence political outcomes.

2.5 Most Subsidies Are Distortionary

Poorly designed subsidies lead to significant distortions that can contribute to the misuse of public resources, the deterioration of service providers' performance, and the overexploitation of natural

resources. As a departure from an efficient, perfectly competitive market (Lipsey and Lancaster 1956), subsidies tend to affect the consumption and production decisions of both consumers and

service providers. Though it can be argued that these are not necessarily a direct impact of subsidization, subsidies can intensify prevailing distortions and affect incentive structures, thus exacerbating inefficiencies in service provision.

Contributing to a Misuse of Public Resources

Subsidies, even when structured to reward performance, can generate perverse incentives for service providers if not properly designed. For example, providing subsidies to utilities conditional on the number of connections serviced is a common output-based-aid approach (Rodriguez et al. 2014). A flat amount (subsidy) is provided in exchange for a tangible outcome (e.g., a household's first connection to piped water), in the hope this will promote access to piped water. However, if the government does not additionally guarantee a profit for each customer connected, such an arrangement will, in practice, create an incentive to supply water primarily to high-consumption areas with lower connection costs; meanwhile, smaller, peri-urban, and rural consumers will likely remain underserved.²¹ At the same time, utilities may use this distortion to capture part of the subsidy pie.

Contributing to the Deterioration of Service Providers' Performance

Poorly designed subsidies contribute to inefficiency, and may even threaten service sustainability. Utilities may find themselves trapped in a vicious circle whereby low tariffs lead to revenue losses and required maintenance is postponed, leading to mounting losses. This in turn harms their creditworthiness, inhibiting utilities from accessing commercial finance (Goksu et al. 2017).

As has been discussed, water and sanitation tariffs have historically been set well below cost-recovery levels in most low- and middle-income countries, often with the goal of ensuring that the poor can afford them.

Poorly designed subsidies contribute to inefficiency, and may even threaten service sustainability.

Such tariffs are made possible by the WSS sector's very large sunk costs, long-lived fixed assets with few alternative uses, and large economies of density and scale that lead to a very high ratio of fixed to variable costs. WSS utilities can operate for long periods of time without recovering all of their fixed costs, although these costs will need to be covered eventually to facilitate necessary repairs and replacement. The maintenance needs of underground piped networks in particular are difficult to observe and monitor, often leading to underinvestment in their maintenance. Inadequate maintenance shortens the life span of assets, reduces service quality and coverage, and contributes to financial losses.

Faced with the severe social costs stemming from the interruption of a crucial service, public authorities generally opt to heavily subsidize service providers. But this may weaken fiscal discipline, as poorly designed subsidies often have perverse incentives that encourage cost padding, condone inefficiency, and undermine service quality. Importantly, such dependence on a government subsidy renders the

utility particularly vulnerable to economic and political shocks, which can lead to the deterioration of service and even the eventual collapse of the utility (see box 2.6).

As visualized in the accountability framework for service delivery developed in the *World Development Report 2004*, the main channels of accountability are relationships between three sets of actors: policy makers and politicians, service providers, and citizens (see figure 2.6). The most efficient way for citizens to hold service providers accountable is through client power, known as the “short route” of accountability, whereby service providers must meet the demands of the consumer—quality service at an affordable price—to maintain viability. Meanwhile, the “long route” of accountability—which relies on the state as an intermediary—is important in meeting priorities not reflected in the purchasing power of consumers (World Bank Group 2003). Yet, when heavily subsidized, a utility's cost-benefit calculation changes; while under free market conditions, the revenue to be gained from undertaking any

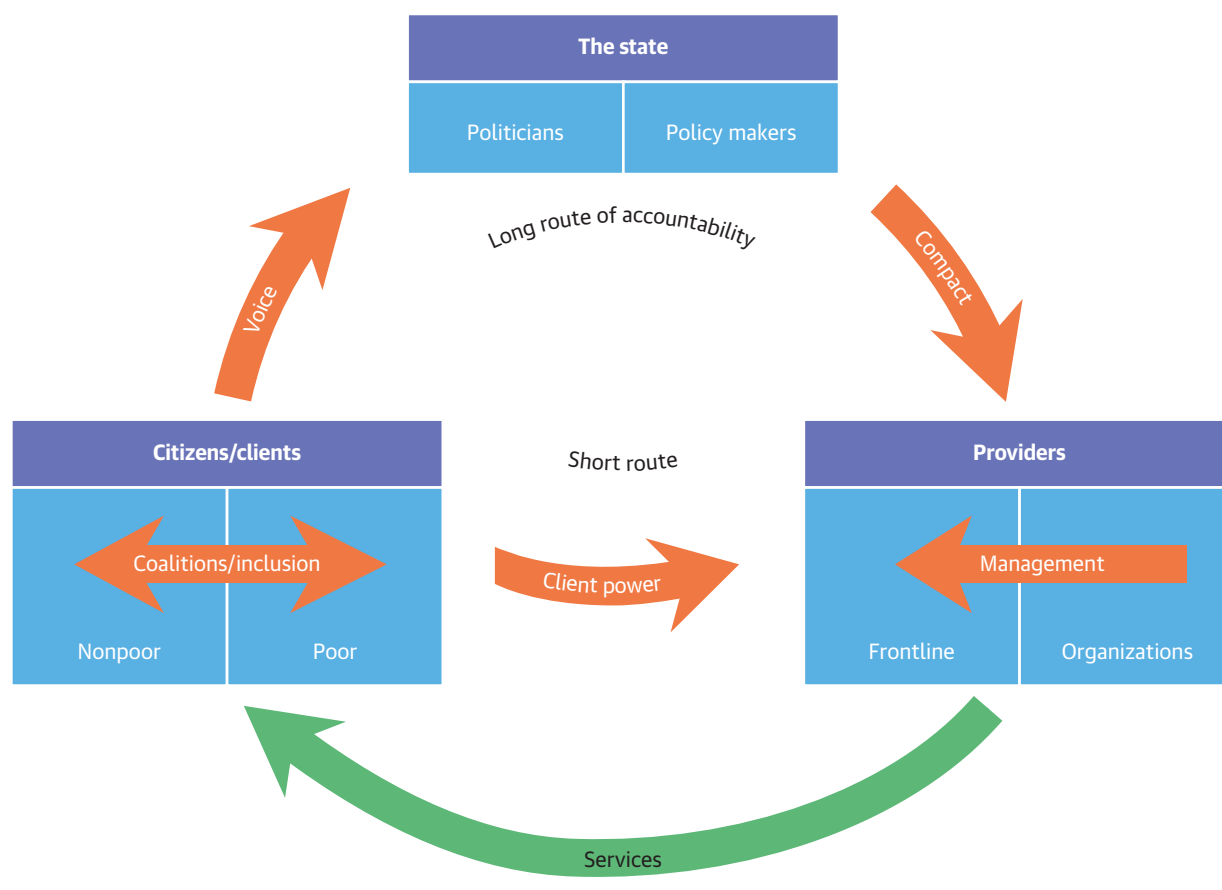
BOX 2.6. Subsidies and Resiliency to Economic and Political Shocks: The Case of South Sudan

South Sudan has been unable to provide its urban population with a reliable water supply due to an overdependence on subsidies whose funding rests on the fluctuations of a commodity market. Since the 2005 signing of the Comprehensive Peace Agreement that paved the way for the establishment of the independent Republic of South Sudan in 2011, the state's incentive to invest in and develop urban water supply has fluctuated. Factors include the availability of oil revenues to subsidize supply, the inexperience of the nascent government in undertaking reform, and general security challenges that have often disrupted government revenue flows.

As a result of its dependence on inconsistent government subsidies, public water supply is at best unreliable, but most often nonexistent for urban residents. Private sector water providers have mushroomed to meet demand in urban areas, with water bottlers, jerry can vendors, and water truck haulers serving customers with both treated and untreated water supply, often at very high prices. The expensive, informal, and unregulated private water supply is a daily reminder for most urban residents that the new government is unable to provide the most basic services.

Source: de Waal et al. 2017.

FIGURE 2.6. Routes of Accountability in Service Provision



Source: World Bank Group 2003.

service improvements and extensions to unconnected customers may exceed the costs of such efforts, under subsidized conditions, this potential revenue may now be offset by the potential loss of the subsidy. As a result, client power effectively breaks down, with only the long route of accountability remaining. This route is not only more cumbersome, but depends upon the state acting in the best interests of its citizens.

Contributing to the Overexploitation of Natural Resources

Subsidized tariffs do not reflect the true cost of a service and therefore cannot provide signals that might

encourage efficient production or consumption. By affecting prices, subsidies indirectly distort economic agents' choices. On the supply side, subsidies may discourage utilities from increasing their efficiency by reducing water losses. On the demand side, subsidized prices may discourage consumers from seeking more efficient providers or encourage overconsumption in a context where true prices would encourage conservation. Therefore, when subsidies are not responsibly managed, they can have large-scale negative impacts on the environment and prevent efficient resource use and allocation.

Pricing strategies that do not cover the full cost of service incentivize overconsumption. Flat rates

provide the starkest example of this, since payment is not conditional on the amount of water consumed. Usually these flat rates do not generate enough revenue to cover the cost of providing piped water and result in substantial amounts of subsidies, which are not targeted to the poor. So why do inadequate pricing strategies persist? One reason is that they are easy to understand and implement, which are crucial factors where administrative capacity is limited. Moreover, flat rates are preferred by large consumers of water, which are likely to have influence in political spheres. To counteract overconsumption, quantity-targeted subsidies such as increasing block tariffs (IBTs) are options, given that a higher tariff can be set above a certain volume to create a disincentive to consume more than a given quantity. However, for an IBT to achieve the objective of reducing water use, customers must respond to marginal, not average, prices. But because tariffs in most low- and middle-income countries are so low, households are more likely to respond to average prices (the total bill) than marginal ones.²² Also, many IBT tariff structures are complex and hard to understand, which is likely to strengthen the focus on average costs (Nauges and Whittington 2017).

The ramifications of such inefficient production and overconsumption can be profound—water insecurity resulting from the overexploitation of water resources has contributed to some of the most tragic humanitarian crises over the past decade, including the civil war in Syria, local conflict and collective violence in Yemen, instability in northern Mali, and ethnic conflict in Kenya (Sadoff, Borgomeo, and de Waal 2017). Even high-capacity environments are not immune; Cape Town, South Africa, recently requested the World Bank’s advisory support after years of environmentally unsustainable WSS policies and unprecedented drought left the city on the brink of running out of water (World Bank Group 2018a).

Notes

1. The economic subsidy of a utility is calculated as the difference between revenue and the economic cost of service. The economic cost of service encompasses all the economic resources deployed for service provision, including the cost of not only O&M but also all capital (depreciation plus return on capital), as well as costs imposed by operational inefficiencies. The methodology used to estimate the economic cost of service provision for each utility in the IBNET database is discussed in detail in appendix B.
2. See Komives et al. (2005), chapter 2, and the references therein.
3. This is a controversial issue since the mere existence of a subsidy may create perverse incentives for the utility to relax its productive efficiency, hence augmenting the need for the subsidy. Subsidies to the supplier (i.e., those given directly to the utility like payment for labor, power, or chemicals) disincentivize production efficiency gains. Furthermore, the monopolistic nature of networked service, in combination with poor regulation, allows utilities to pass the costs of their inefficiency on to users (and, eventually, the government).
4. Different service types typically entail different costs. The same utility may choose to provide services of varying quality levels to appeal to users with differing consumption needs or abilities to pay.
5. See background paper 2 (listed in appendix A) for an analysis and quantification of the impact of inefficiencies on costs and subsidies.
6. The Chilean method aims to maximize both allocative efficiency (by setting tariffs equal to marginal costs) as well as productive efficiency (by producing efficient quantities at the lowest cost possible, without passing on additional inefficiencies to the customers through pricing) and also allows each utility to generate enough revenue to cover the costs incurred in providing the service. The customer bases of the various Chilean water and sanitation utilities range widely in size, from a few thousand to even over a million, reflecting the heterogeneity present within the sector globally. The resulting data capture the nuances of various cost structures, improving the accuracy of the Chilean model utilities when compared with other countries that have undertaken similar approaches.
7. In this context, greenfield capital investment refers to the capital investment required to construct all facilities necessary to provide a given level of WSS services to a utility’s customer base, independent of any preexisting infrastructure or site-related constraints.
8. It is important to note that our use of Chilean data as a basis for estimation does come with a few limitations. An assumption made in our methodology is that Chile’s geographical conditions are faced by all utilities. In our model, we assign an asset per customer value based on data from 15 Chilean firms, while in reality a utility’s investment plan is strongly influenced by the geographical conditions of the area it serves. For example, greater investment in certain assets may be required to operate in a particular environment. More specifically, different countries have access to different water sources that facilitate (or complicate) extraction, leading to lower (or higher)

- expenditures on assets. In addition, access to technology plays a role, for example, newer and better machinery can greatly reduce a utility's operational expenditures. Also, Chile is among the world's most open economies, with low to nonexistent import taxes, while commercial barriers in other countries drive up the cost of imported assets, resulting in higher capital expenditures. Quality standards also vary between countries: high-income countries usually have higher standards than low-income countries. As a consequence, the latter often require more investment to improve service quality, which is reflected in higher tariffs.
9. Although utilities in many countries treat fecal sludge collected from on-site sanitation options, these costs are excluded from our estimation due to data constraints.
 10. See more details about the methodology in appendix B.
 11. A collaborative effort of the United Nations and World Health Organization, the Joint Monitoring Programme is tracking international progress toward the Sustainable Development Goals.
 12. It is important to note that consumption subsidies include all subsidies that reduce the recurring cost of service to users, that is, subsidies earmarked to reduce tariffs directly, as well as those that reduce the cost of service provision, and thus reduce tariffs indirectly. These include general budgetary support to service providers, support toward capital investments, reduced costs of inputs or taxes, and so on. Access subsidies, conversely, reduce a user's one-time access cost to a level below the cost of extending service to that user.
 13. The restriction of the study to 10 countries, chosen based on geographical diversity and also the availability of data, is due to time and resource constraints, and the scope might be expanded in the future. See more details about the methodology in background paper 7 (listed in appendix A).
 14. The value of the subsidy to each connected household was calculated using imputed water consumption volumes from self-reported household water expenditure data, and multiplying this quantity by the difference between the cost-recovery tariff and the average unit price of water paid by that household. The cost-recovery tariff was calculated using the methodology presented in section 2.2 for estimating the magnitude of subsidies.
 15. A subsidy reduces inequality if it is less regressive than the distribution of expenditure or income.
 16. Our analysis follows the methodology from Komives et al. (2005), which defines the targeting performance indicator (Ω) as the share of subsidy benefits received by the poor (S_p/S_H), divided by the proportion of poor households in the total population (P/H). The indicator can be split into factors related to water network access and subsidy design. Factor values below 1 indicate that the factor contributes to reduced target performance, and vice versa.
 17. This assumes that the service is not new and that wealthier households have, by and large, already connected to the service.
 18. The problems associated with asymmetric access to information between utility companies and regulators have received a lot of attention in the economic literature, notably by Joskow (2005) and Laffont and Tirole (1993).
 19. For example, in Honduras, according to evidence discussed by Savedoff and Spiller (1999: 49), "In SANAA [Servicio Autónomo Nacional de Acueductos y Alcantarillados], the workforce captures a large proportion of system rents through a union that has established very high staffing levels in Tegucigalpa . . . the union has acquired such strength and predominance in the company that the nomination of technical, administrative, and manual staff requires union approval, as do decisions related to operations and control." In practice, however, levels of expertise and autonomy from piped-water providers vary substantially across contexts. In many countries, providers have been commercialized and/or privatized to increase autonomy, but there is often no clear way to guarantee that technocrats and managers are insulated from political elites. Moreover, the deeply intertwined relationship between the state and utilities, especially when service providers are dependent on public financing, can give leverage to government actors, further compromising service providers' autonomy (Mason, Harris, and Batley 2013).
 20. For more on the general governance of intergovernmental transfers, see Broadway and Shah (2007).
 21. This was found to be the case in Côte d'Ivoire, where the private water system operator was reimbursed a flat fee for each social connection. This led to inefficiencies and poor subsidy coverage, as informal settlements and particularly poor areas were underserved (Lauria and Hopkins 2004).
 22. For instance, Ito (2013) finds that consumers in Southern California adjust their water consumption in accordance with changes in average price, rather than marginal or expected marginal price. This suboptimizing behavior makes nonlinear pricing unsuccessful in achieving its policy goal of conservation and further impacts its effect on welfare. Ito (2014) finds similar results for electricity pricing.





CHAPTER 3

Designing Effective and Efficient Subsidies

Although current water supply and sanitation (WSS) subsidies tend to be pervasive, expensive, nontransparent, distortionary, and poorly targeted, such poor outcomes are not a given. Well-designed subsidies are indeed an important and necessary policy instrument for decision makers, who can use them to effectively and efficiently attain their objectives and avoid the adverse impacts of the past.

Improving the efficacy and efficiency of subsidies requires careful consideration of five key questions:

1. *What is the context?*
2. *What are the policy objectives that the subsidy seeks to achieve?*
3. *What are the target service(s) and/or population(s)?*
4. *How will the subsidy be funded?*
5. *What subsidy design will be most effective and efficient?*

In this chapter, we provide guidance to policy makers on how each of these questions may be best approached. Since socioeconomic factors, WSS service delivery modalities, levels of institutional capacity, and fiscal space vary substantially from context to context, we do not seek to provide explicit recommendations on what should be subsidized and how. Instead, we discuss the myriad factors and policy options that should be considered along the way, therefore providing a roadmap for policy makers to follow in assessing their particular context and determining the most effective and efficient subsidy design.

3.1 Understanding the Context

The first step in designing effective and efficient subsidies is to understand the policy context within which the subsidy will be implemented. It is important for policy makers to develop a thorough understanding of the current structure of the sector and the efficacy of existing subsidies in achieving their underlying

goals. Subsequently, a political economy lens should be used to assess the sector's institutional and financial structure, the reasons behind an unsatisfactory status quo (where applicable), and opportunities to improve and propel subsidy reform. Finally, policy makers should investigate the affordability barriers to WSS service provision. By developing a thorough understanding of which households are unable to afford access and/or consumption costs, they can better identify the service(s) and/or population(s) that subsidies will need to target.

Understanding Existing Subsidy Performance

Policy makers should seek to understand how effective and efficient existing subsidies are at attaining their underlying goals prior to deciding how they should be reformed. As discussed in chapter 2, most existing subsidies are expensive, poorly targeted, not transparent, and distortionary. Policy makers should invest in a thorough analysis of how existing subsidies perform in relation to each of these characteristics. In particular, they need to understand the magnitude of public resources being expended, the ultimate beneficiaries of these resources, the public's perception of the subsidy and any opportunities for misappropriation, and the adverse impacts on sector performance and resource allocation. Using this information, policy makers can then improve subsidy design to avoid current pitfalls.

An assessment of existing subsidy performance begins with an estimation of the magnitude of public expenditure and the ultimate beneficiaries of that expenditure. This magnitude represents the public resources that, even in the absence of increased budgetary allocations from the government, are at play in the reform process. Accounting for implicit, in addition to explicit, government transfers can clarify that the magnitude of subsidy is greater than previously understood, raising the priority of reform

from the perspective of both the government and taxpayers. By identifying the ultimate beneficiaries of the subsidy and how they compare with those outlined in the original objectives, the subsidy's targeting efficiency and the extent of any required reform can be assessed.

Policy makers should subsequently assess the transparency of the subsidy, focusing particularly on public perceptions and opportunities for rent-seeking. As discussed in section 2.4, a lack of transparency allows some service providers to misuse scarce public resources, failing to benefit customers through improved service quality and/or reduced costs. Understanding a subsidy's current degree of transparency will shed light on opportunities for improvement.

Finally, any distortionary impacts that reduce the efficacy and efficiency of WSS service provision should be considered. As discussed in section 2.5, poorly designed subsidies lead to significant distortions that can contribute to the misuse of public resources, the deterioration of service providers' performance, and the overexploitation of natural resources. Such adverse impacts can be mitigated by gaining an appreciation of the scale of the problem and reconsidering a subsidy's design accordingly.

Understanding the Political Economy

Upon investigating the factors related to the technical design of existing subsidies that affect performance, policy makers require a comprehensive understanding of the political economy factors that also impact subsidy performance and, importantly, can either propel or hinder subsidy reform. Thus far, this report has highlighted many such factors, including: distributional concerns about who benefits and how this might sway their political support; citizens' expectations and (sometimes inaccurate) perceptions regarding who benefits from subsidies; whether or not users

are expected to pay for the full cost of services; and asymmetries of information between central and local governments, as well as between these governments and service providers.

Efforts to reform subsidies have had widely varied results across countries, with successes often predicated on reformers' ability to understand and strategically overcome political barriers. The required analysis will generally consist of three steps:

- 1. Assessing the current setup.** An assessment of (i) the WSS sector's institutional structure and (ii) how subsidies are currently organized allows for a better understanding of the prospects for reform. This process begins with a thorough cataloging of existing subsidies, including their objective, type, scale, beneficiaries, and the scale of distortions that they cause. An analysis of when, how, and why subsidies developed, and what their original objectives were (whether formally stated or hidden), can highlight valuable characteristics of the political and administrative decision-making process, including how interest groups are organized, their relative influence over policy, and their priorities. Also, the areas and services favored by subsidies—for example, water vs. sanitation, networked vs. nonnetworked water, sewerage vs. on-site sanitation, and rural vs. urban areas—might reflect implicit government biases that may need to be reconsidered.
- 2. Understanding reasons behind an unsatisfactory status quo (where applicable).** If a particular subsidy was initially conceived to be short term, its reasons for persisting should be investigated. Where a subsidy is failing to achieve its intended objectives, a political economy analysis can determine the key institutional and policy-related bottlenecks that explain its

poor performance. These might hinge on institutional factors—such as a lack of organizational or fiscal autonomy—that affect the incentive structures of the service provider or other stakeholders. The political economy reasons for the persistence of ineffective policy are particularly important to consider when analyzing subsidies that target the poor. Increasing block tariff consumption subsidies in many countries, for example, have proven to primarily benefit the rich, and remain in place due, in part, to the disproportionate political influence of the rich. Understanding a dynamic like this sheds light on the political forces and coalitions that will need to be either fostered or overcome to move past an unsatisfactory, yet stable, status quo.

- 3. Identifying opportunities to improve and propel subsidy reform.** Building upon an understanding of the current political economy of the WSS sector, attention can now be turned to the future: identifying opportunities for reform and developing strategies to overcome institutional and policy-related bottlenecks. Important lessons about what works can be gleaned from the experiences—both successful and not—of various countries presenting contextual similarities.¹ Policy makers should use their understanding of the local political economy to develop a plan to both (i) mobilize political coalitions to support the intended reform (see section 4.2 of chapter 4 for more detail); and (ii) sequence the elements of a subsidy reform package² so as to improve the likelihood of its success.

Understanding Affordability

An up-front understanding of affordability barriers to WSS service provision is imperative to the subsidy design process. The number of households facing

affordability barriers to WSS service accessibility, their relative socioeconomic characteristics and geographic locations, and the gap between what each household can reasonably be expected to pay and the total cost of service, in addition to any liquidity barriers, are all crucial to answering the four subsequent key questions. Affordability determines: (i) whether a subsidy is required to advance equitable access to affordable WSS services; (ii) the service and/or population that should be targeted; (iii) the magnitude of the subsidy required, which in turn constrains the available funding options; and (iv) the subsidy design options that would be most effective and efficient.

In brief, affordability entails that a bundle of WSS services with multiple attributes such as quantity, quality, and timing is available at a price that does not

impose an “unreasonable” burden on the consumer.

Affordability will therefore vary across households, and depends upon the selection of the bundle of WSS services determined by the policy maker to be desirable. Different baskets of WSS services may be assigned to different users and in different contexts, reflecting that: (i) service providers may offer users various levels of service; and (ii) policy makers’ targets for service provision are shaped by context-specific factors such as cultural preferences or resource constraints. The higher the standard of service a basket represents, the fewer the number of households who will find it affordable.

Despite the importance of affordability, there is no consensus on how to measure it, though various options have been proposed by policy makers. Box 3.1 describes the most common method for measuring

BOX 3.1. An Improved Approach to Measuring WSS Affordability

The most common method for measuring affordability is to compare a household’s spending on water and sanitation to its total expenditure (Smets 2012). This ratio is then compared with a defined value, or threshold. If the ratio exceeds the threshold, then it signals that water supply and sanitation (WSS) costs are unaffordable. There are several drawbacks to this approach, however, including its reliance on possibly inaccurate expenditure estimates, and its inability to capture the entire spectrum of costs for WSS services. Also, as it focuses on measuring what a household can “fairly” be expected to spend on WSS services, it may not capture what the household is actually willing and able to pay.

An improved approach based upon the poverty line, the accepted methodology for measuring poverty, can overcome many of these drawbacks to better assess the affordability of WSS services. Poverty is commonly measured by comparing household income to a set poverty threshold or minimum income needed to cover basic needs. Households whose income falls below the threshold, or line, are considered poor or unable to afford the goods and services necessary to meet their basic needs. Note that this approach considers the following elements: (i) basic needs, defined as a basket of goods and services; (ii) the costs^a of this basket of goods and services; and (iii) the total income distribution within the relevant population. Note also that this approach does not consider families’ actual expenditure on the items included in the defined basket, or their willingness to pay for them.

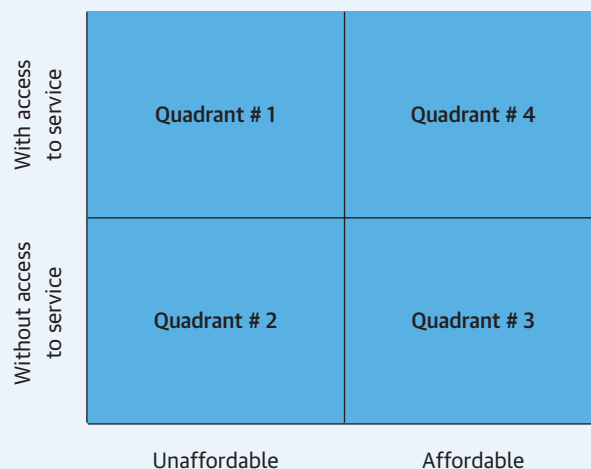
box continues next page

BOX 3.1. continued

Under an improved model, a predefined level of water supply, sanitation, and hygiene (WASH) service is unaffordable to a household if the cost of purchasing that level of service is more than a fixed share^b of the total consumption expenditure. This approach provides additional information directly relevant to policy makers; it can disaggregate households on the basis of: (i) whether they currently have access to the pre-defined level of service; (ii) whether they can afford the recurring costs of using the service; and (iii) whether those who currently lack service could afford the initial fixed costs of connecting to/accessing the service. Moreover, the method provides insight into the difference between households facing fully cost-reflective prices (i.e., before subsidies) and households facing subsidized prices. This can contribute to improving the targeting and transparency of government resources designed to facilitate access to WASH services.

This approach also facilitates a scenario analysis, determined by whether a household currently uses the minimum basket of WSS services, and whether it is able to pay for these services. We visualize these scenarios as four quadrants (figure B3.1.1): households who currently use the minimum basket of services but cannot afford to pay for it (Quadrant 1);^c households without access to the minimum basket of services and who cannot afford to pay (Quadrant 2), households without access but who could pay (Quadrant 3), and households who currently use the minimum basket of services and can pay for it (Quadrant 4).

FIGURE B3.1.1. The Access and Affordability of Service: Four Scenarios



Source: Andres et al., forthcoming.

Note: This figure considers a hypothetical "basket" of services that would meet a household's basic needs. The word "access" is used to denote both access to services *and* their continuous use. In other words, affordability takes both access and consumption charges into account.

Source: Andres et al., forthcoming.

a. The approach allows for flexibility in how costs are estimated. Such costs can include the total initial and recurrent costs (i.e., before any subsidies are applied) or only the tariffs and fees that households actually pay (i.e., the postsubsidy price).

b. The commonly used threshold of 5 percent can be adopted, or policy makers can define their own threshold based upon the local context.

c. Note that households in quadrant 1 are currently paying for the minimum basket of services despite being classified, according to the chosen affordable threshold, as unable to afford the costs. Since these households are currently paying for and using the services, households without access to the service are likely a higher policy priority. Nevertheless, policy makers may choose to provide subsidies to these households to bolster their disposable income available for other purposes.

affordability and proposes an improved approach, which facilitates a more comprehensive analysis of affordability by disaggregating households on the basis of: (i) whether they currently have access to the predefined level of service; (ii) whether they can afford the recurring costs of using the service; and (iii) whether those who currently lack service could afford the initial fixed costs of connecting to/accessing the service.

A comprehensive analysis of affordability, such as through the method proposed in box 3.1, provides the policy maker with important insights into which populations require support, and whether one-time access costs or recurrent consumption charges pose the greatest challenge to affordability. The policy maker can then use these insights to inform key policy decisions later in the subsidy design process: (i) whether or not a subsidy is required to advance equitable access to affordable WSS services; and, if a subsidy is decided on, its (ii) target service(s) and/or population(s), and (iii) most effective and efficient design. From a policy point of view, households without access and unable to pay for the prospective service are of the most interest,³ since they are the ones most likely to benefit from targeted subsidies aimed at increasing access to services. Furthermore, the development of two separate affordability models—

one including access costs in addition to consumption charges and one without—can identify which households within this quadrant require merely a subsidy for initial access costs, and which households would additionally require a recurrent subsidy of consumption charges.

A single policy instrument—no matter how ingeniously designed—is unlikely to meet all policy objectives simultaneously.

3.2 Defining Policy Objectives

The specific policy objectives that a prospective subsidy seeks to attain largely dictate its design. As discussed in chapter 1, the most common policy objectives that WSS subsidies seek to attain are:

- **Advancing equitable access to affordable WSS services**
- **Harnessing positive externalities associated with WSS services**

The first policy objective specifically targets the provision of WSS services to the poor and marginalized, while the second objective aims to promote specific services or behaviors in geographic areas that have an outsized impact on broader society, namely through environmental impacts and/or public health. Before moving forward, it is important to note that in most cases, a subsidy's target population or service will differ depending upon which objective is selected. Therefore, multiple objectives will generally require targeting different populations or services.

A single policy instrument—no matter how ingeniously designed—is unlikely to meet all policy objectives simultaneously. As an example, a subsidized price may make access to water more affordable but at the same time may condone waste and even compromise the sustainability of service provision. Different objectives call for the use of different instruments. For instance, prices can be raised to promote cost recovery and signal scarcity, but equity considerations may call for any price increases to be accompanied by compensation or transfer mechanisms (World Bank Group 2018c).

There are many ways in which subsidies can advance equitable access to affordable WSS services, all of which seek to either reduce the cost of service to end users (i.e., ensure a minimum level of consumption)

or expand service areas to unserved populations (i.e., expand access). Costs of service can be reduced through either supply- or demand-side subsidies. For example, any reductions in the costs of infrastructure construction/rehabilitation or operations and maintenance may, ideally, be passed down to users in the form of lower prices. Similarly, any investments that improve the operational efficiency of a service provider should reduce costs to users. Demand-side subsidies can also be used to directly reduce user tariffs. Meanwhile, the population that can access WSS services can be expanded through the subsidization of new infrastructure and services, such as new pipelines into previously unserved neighborhoods, new community-level water points and water schemes, fecal sludge management facilities, or supply chains. The choice of approach has implications related to targeting, transparency, and distortionary effects, as discussed in further detail in the next section.

Meanwhile, the pursuit of positive externalities will lead to the prioritization of populations and services that have increased potential to positively impact the environment and/or improve public health. Oftentimes, effective and efficient subsidies for this purpose require the consideration of factors—such as population density, environmental sensitivity, and drainage and effluent evacuation—that would not be considered under the goal of equitable access. For example, the environmental and health implications of poor WSS services in densely populated urban areas will generally exceed those in more rural areas. Also, despite the primordial importance of potable water at the individual level, improved sanitation services may present greater positive externalities at the community level (Lauria, Hopkins, and Debomy 2005). These issues are discussed further in the next section.

3.3 Identifying the Target Service(s) and/or Population(s)

Upon selecting a policy objective, policy makers must determine which service(s) and/or population(s) will be targeted. As with policies in general, there is no *one-size-fits-all* solution to the problems of inadequate access to or consumption of WSS services: the most suitable policy will depend on the specific goals to be attained, the context in which it is to be implemented, and the resource constraints of the government and stakeholders.

There is no one-size-fits-all solution to the problems of inadequate access to or consumption of WSS services.

In this section, we discuss the trade-offs inherent in subsidizing different services, populations, or costs in the WSS sector and how these choices affect the efficient attainment of the chosen objective. Although subsidies with a policy objective to advance equitable access to affordable WSS services will, by definition, seek to benefit the poor and marginalized, the decision to target, for example, a particular service (e.g., networked or nonnetworked) or geographic area (e.g., rural or urban) will establish the eligibility of particular segments of the population, even before any selection of a targeting mechanism. Even though these trade-offs are neatly categorized to aid the process of analysis, it should be noted that there is considerable overlap among them, and their relevance will depend on the specificities of the case at hand.

Water vs. Sanitation

Although access to both water and sanitation is considered a human right⁴ and is the focus of one of the Sustainable Development Goals (SDGs),⁵ the general scarcity of public resources often prevents governments from fully addressing the factors that make

TABLE 3.1. Pros and Cons of Subsidies for Water vs. Sanitation

Water subsidies		Sanitation subsidies	
Pros	Cons	Pros	Cons
• Address a primary need • Have immediate impact on households' health and well-being	• May encourage overconsumption	• Have large economic returns thanks to their positive effects on public health and the fact that existing access levels are typically low • Have large potential impact on demand, since households are usually less willing to pay for sanitation than for water • Can improve water resource quality by encouraging households to safely evacuate and treat human waste	• May require subsidies for behavioral change programs (and not just infrastructure) to be fully effective • Less attractive to politicians since the benefits to human health are delayed, diffused, and more difficult to trace back to subsidies (although well-being may be immediately impacted through gains in convenience and dignity)

Source: Authors' compilation.

these services unaffordable to some citizens. Therefore, policy makers will need to make difficult decisions regarding which service to prioritize when allocating their budget. As noted in table 3.1, several arguments can be made in favor of either water or sanitation.

Although water subsidies address a primary need, appropriate sanitation systems may provide a better economic return due to their substantial positive externalities. For one, the quality of water sources can be undermined by contamination from poor sanitation systems, rendering sanitation systems essential to sustaining the benefits gained from improved access to water. Additionally, there is evidence that the positive externalities (i.e., associated benefits to society) of a private water connection are lower than those of a private sanitation facility. Inadequate sanitation systems have hazardous effects on the entire population because of the many diseases related to the improper disposal of wastewater and human feces (Lauria, Hopkins, and Debomy 2005). The World Health Organization (WHO 2012a) estimates that the global economic

return on efforts to attain universal access to improved sanitation is \$5.50 per U.S. dollar invested, while this figure is \$2 for water.

Meanwhile, the benefits to be derived from sanitation, mostly related to health, are generally more diffused, more delayed, and less obviously attributable to the uptake of services than are the benefits derived from consuming water,⁶ although well-being may nevertheless be immediately improved through gains in convenience and dignity, particularly for women (WHO 2018). As a consequence, people are more aware of the benefits of water services, a large share of which are private benefits (e.g., the improved odor and taste of higher-quality water, the health benefits of clean water, the time saved by a water connection on premises, etc.). Thus, households are in general more willing to pay for water rather than for sanitation services, leaving an important role for sanitation subsidies. Related to this, although behavior change might also be needed to enjoy the benefits of improved water (e.g., some communities prefer the taste of untreated water to treated water, or even surface water to groundwater [Kulinkina et al. 2017]),

habits pose a particular obstacle to improved sanitation. For example, in India it has been found that many people see open defecation as a healthy and socially acceptable practice, and insist that storing feces close to home will render the home impure (Gupta et al. 2017).

The extent to which sanitation is a priority will depend on the characteristics of the population in question, particularly the percentage of the population with access to safely managed water supply, and the population density. Sanitation may be a particularly high priority for public resources where access to water has already been sufficiently addressed or where the problem of insufficient access to sanitation is exacerbated by poor drainage, flooding, or related problems. In densely populated areas, the substantial public health implications of poor sanitation provide an additional argument in favor of prioritizing sanitation over water.

While many of the above arguments point to a strong case for subsidizing sanitation over water, global expenditure on sanitation is approximately half that for water (WHO 2017: 30), and in some low-income countries the difference is even greater (in Nigeria, for example, 96 percent of WSS expenditures went to water in 2014 [World Bank Group 2017c]). This in part explains the lagging levels of sanitation coverage. The fact that returns to sanitation investments take longer to materialize and are less visible to households could explain why politicians may prioritize water over sanitation. Yet, as has been discussed here, access to both is of vital significance, pointing to a need to better balance public expenditure between the two.

Urban vs. Rural Areas

Even with rapid urbanization, rural populations still constitute the majority of the world's poor and are more homogenous in terms of income than are urban

populations (Ravallion, Chen, and Sangraula 2010). Most rural communities are poor, a majority (80 percent) of the poorest households are found in rural areas (Castaneda et al. 2016), and rates of access to WSS services are lowest in rural areas (WWAP 2019). The Joint Monitoring Programme estimates that only 55 percent of rural households use safely managed drinking water services, compared with over 85 percent of urban ones. A gap can also be observed in access to safely managed sanitation: 34.6 percent in rural areas versus 43.2 percent in urban areas.² These factors imply that subsidizing rural services is the most effective means of both targeting scarce resources toward the poor and increasing their levels of access to services. Yet the majority of current consumption subsidies focus on urban piped networks (as noted in chapter 2, section 2.3).

Similarly, most donor funding for WSS services goes to urban areas (WHO 2017). A WHO report on South Asian countries found that 77 percent of such funds targeted the extension of services in urban areas (WHO 2012b). The 2017 GLAAS report estimates that, in a sample of 13 countries, nonhousehold expenditures on WSS services in urban areas were three times what they were in rural areas (WHO 2017). To better understand the rationale behind this bias and whether it should be revisited, we explore the pros and cons of subsidizing either rural or urban services in table 3.2.

While basic water services can be provided through less-expensive solutions in both rural and urban communities, delivering SDG-compliant water services is more challenging in rural communities than in urban ones. Networked services—which, in urban areas, are generally the most cost-effective means to achieve the SDG target of a safely managed water supply on household premises—may not be financially feasible amid the low population density of rural areas since economies of scale cannot be exploited. Therefore,

TABLE 3.2. Pros and Cons of Rural vs. Urban Subsidies

Urban subsidies		Rural subsidies	
Pros	Cons	Pros	Cons
• Greater consumer heterogeneity permits the use of cross-subsidies (between different categories of service), thus tapping consumers as a funding source • May require less subsidization for similar technologies due to economies of scale (if networked services are provided by a few large providers) • May cost relatively little to design and implement (or reform), since both users and providers (and, in some cases, institutional stakeholders) are concentrated in a small space • May generate large benefits to public health and the environment amid higher population density	• Where poor households are distributed throughout a service area, geographic targeting can be difficult (and errors of inclusion likely) • If targeted, usually requires a costly administrative system • The reform of inefficient subsidy schemes favoring urban households may be more difficult than those favoring rural households, since urban households often have more political power	• Geographic targeting may be easy since there is a strong correlation between location and household income/resources in rural areas • May benefit the poorest households, the majority of which generally reside in rural areas • May be used to support campaigns raising awareness of hygienic practices, which may be the most effective in rural, homogeneously poor areas and may have the potential to mobilize household resources	• The need for community involvement to be sustainable (especially where services are managed at the community level) adds complexity • More likely to require subsidies for behavioral change programs, beyond infrastructure subsidies, to increase demand for services • The presence of multiple providers across a large area may increase the cost of designing and implementing subsidies

Source: Authors' compilation.

policy makers need to consider whether scarce public funds are best allocated toward (i) providing SDG-compliant services or (ii) much cheaper services that have the potential to benefit more households, yet merely comply with the now-outdated Millennium Development Goals (and may include water points and water schemes with public taps that impose a significant burden of collection, in terms of both time and distance, on users).

On the other hand, improvements in WSS services in urban areas have a larger impact on public health (Hathi et al. 2017). This is simply because the negative spillover effects (or externalities) of inadequate water and sanitation are amplified where populations are large and dense. It should be noted, however, that extending service to informal urban settlements (such as slums), where

population density is often the greatest, involves significant administrative and technical challenges that may preclude the provision of SDG-compliant household connections, requiring instead alternative technologies such as public taps and public toilets.

Networked/Sewered vs. Nonnetworked/On-Site Services

Despite the fact that nonnetworked and on-site services are an integral part of a sound WSS strategy in most countries, most subsidies are for networked water and sewered sanitation services. According to the 2017 GLAAS report, assistance in setting up “basic systems”⁸ (a category mostly made up of water or on-site sanitation) involved only a quarter of official development assistance disbursements

TABLE 3.3. Pros and Cons of Subsidies for Networked/Sewered vs. Nonnetworked/On-Site Services

Subsidies of networked/sewered services		Subsidies of nonnetworked/on-site services	
Pros	Cons	Pros	Cons
- Facilitate exploitation of economies of scale in densely populated areas - Mostly support on premises services (required for SDG compliance)	- Only benefit households that are connected or can potentially connect to the service, which tends to exclude the poorest - More expensive technologies entail less beneficiaries per dollar spent	- Usually target rural areas where most of the poor live (better targeting) - Less expensive technologies entail more beneficiaries per dollar spent	- More likely to require subsidies for behavioral change programs (and not only infrastructure) to increase demand for services - May require training of users or community members to conduct periodic maintenance - May promote a lower level of service

Source: Authors' compilation.

for water and sanitation in 2015—that is about \$1.9 billion of a total \$7.4 billion spent that year in the sector (WHO 2017). Meanwhile, most subsidies for networked services end up, in practice, benefiting the richest (and most powerful) households and producers, while discouraging efficient and sustainable service provision and consumption.² To inform allocative decisions, it is important to investigate the pros and cons associated with the subsidization of either networked/sewered or nonnetworked/on-site services (table 3.3).

Subsidies of networked/sewered services will only benefit households that: (i) already have access to services (consumption subsidies), or (ii) live within the service area, are eligible to connect, and thus would gain access through the subsidy itself (connection subsidies). Networked and sewered services entail technology that tends to be more expensive than their nonnetworked and on-site counterparts, although their per capita costs can be greatly reduced in densely populated areas by exploiting economies of scale. Also, networked water supply services are typically more reliable than many nonnetworked solutions and, unlike the majority of common nonnetworked solutions, allow for a service quality that is SDG compliant.

For sanitation, most on-site solutions can be SDG compliant. In low-income countries, networked/sewered WSS coverage rates are relatively low overall, and typically concentrated in certain geographic areas. In such circumstances, connection subsidies in areas already covered by a network, or capital expenditure subsidies for network expansion in key unserved areas, could reach the poor who would not benefit from consumption subsidies.

However, it is not possible or economically efficient to expand networks or facilitate additional connections in most rural neighborhoods, and even certain urban or peri-urban neighborhoods. In many rural areas, networked water and sewered sanitation services are cost prohibitive amid low population densities. Here, looking beyond networked solutions may reveal a viable alternative. Meanwhile, their lack of feasibility in urban or peri-urban neighborhoods may be due to physical or administrative constraints (such as within urban slums) or because the targeted households are unable to afford consumption tariffs. In such neighborhoods, alternative service providers may offer an acceptable short-term solution to the problem of water and sanitation provision.

Where the poor are concentrated in areas without access to networked services, subsidies for nonnetworked water or on-site sanitation hold promise to increase their access rates. If the goal is to ensure that the maximum number of poor people possible receive a minimum level of service, nonnetworked and on-site options may be preferable to networks, since they are lower cost in general (unless large, geographically concentrated, and well-off populations allow networks benefit from economies of scale).

In certain situations where networked and sewerred services are in place, it may be worthwhile to subsidize consumption, since piped water and sewerage systems usually require a minimum level of use to operate efficiently. In the case of piped water supply, for example, to operate below this threshold is usually more expensive and may adversely affect water quality,¹⁰ implying that in some cases it is more cost-effective for a utility to actually lose water (by generating more than is consumed or paid for) than operate at a suboptimal level. Similarly, underutilized sewer networks are prone to clogging and may therefore require more frequent maintenance.

Access vs. Consumption

According to the 2017 GLAAS report, most countries report the use of some sort of consumption subsidy. By contrast, only 5 of the 43 countries analyzed had set up an access subsidy (WHO 2017). While consumption subsidies aim to ensure that water service tariffs are affordable for the poor, access subsidies aim to increase the number of households with access to those services. Besides this difference in the driving policy goal, both access and consumption subsidies have various pros and cons, elaborated in table 3.4.

High connection charges (in the case of networked water and sewerred sanitation) or initial costs (in the case of nonnetworked water and on-site sanitation) often prove a financial barrier to poor households that might otherwise gain access to water and sanitation services. Connection subsidies are most warranted in countries or regions where rates of access to WSS services (whether networked/sewerred or not) are low, and where connection costs present the greatest barrier to access.

Consumption subsidies, on the other hand, are directed to households that are already connected to a network, and if properly targeted, are not able to afford a specific

TABLE 3.4. Pros and Cons of Access vs. Consumption Subsidies

Access subsidies		Consumption subsidies	
Pros	Cons	Pros	Cons
- Benefit households that currently lack access to the service (which are typically the poorest households) - Low administrative costs - Bring more users into the system and achieve greater economies of scale	Complementary policy measures (to increase demand for services) may be needed to ensure continued use/sustainability	Encourage a minimum amount of water consumption by improving service affordability	- Often poorly targeted due to lack of correlation between poverty and proxy variables used for targeting like water consumption and geographic location (both inclusion and exclusion errors are common) - Administratively costly if targeted - May encourage overconsumption - Can become entrenched/difficult to remove once introduced

Source: Authors' compilation.

level of water consumption deemed critical to human health. To target such subsidies to the poor typically involves high administrative costs (to what degree depends on the targeting method), while untargeted subsidies, though less expensive, will usually entail high inclusion errors (i.e., they will benefit wealthier households as much if not more than poor ones). However, if the poorest lack access to the service being subsidized, consumption subsidies will entail large exclusion errors independent of targeting.

All in all, most of the consumption subsidies found in low- and middle-income countries do not ensure that poor households can access safely managed and sustainable WSS services at an affordable price. Where access rates among the poor are low, and resources are scarce, effectively targeted access subsidies may be prioritized.¹¹ Conversely, where access is widespread but services remain unaffordable to many, well-targeted consumption subsidies might be considered.

Infrastructure On or Off Household Premises

For many poor populations, insufficient infrastructure on household premises represents an important barrier to accessing WSS services. For example, taking

advantage of networked services often requires upgrades or the installation of new equipment or facilities (e.g., bathrooms, drains, plumbing, fixtures such as toilets) either within the dwelling itself or on the surrounding property. Many policy makers overlook the significance of household-level facilities, as subsidies continue to be overwhelmingly channeled toward utility-level infrastructure such as pumping, pipe networks, and treatment facilities. Table 3.5 lists the pros and cons of focusing subsidies on (i) large-scale, shared infrastructure or (ii) personal, household-level facilities.

Constructing a needed facility on household premises represents a one-time, usually high, initial cost. After this, periodic maintenance (e.g., the emptying of pit latrines) also costs something. For the many poor households with severe resource and credit constraints, such costs pose insurmountable barriers. In the case of networked water and sewerage services, governments may consider subsidizing households' personal investments in household facilities, complementing the subsidization of off-premise (i.e., utility-level) infrastructure. The initial costs of household-level facilities, which are often higher than service connection fees,

TABLE 3.5. Pros and Cons of Subsidizing Infrastructure on Household Premises vs. Off Premises

On premises		Off premises	
Pros	Cons	Pros	Cons
• Increase number of connections to networked/sewered services (given their availability) by reducing overall access costs for the poor • Counter the effects of the potentially high per capita costs of a household-level facility's initial construction/installation • Can improve facility design and construction standards	• Less likely to attract political buy-in than subsidies for more visible, large-scale infrastructure • Effectiveness may depend on other complementary investments in networked/sewered infrastructure or fecal sludge management	• More politically feasible • Increase number of connections to networked/sewered services by expanding service area	• May require a minimum threshold of uptake for efficient operation • May require complementary subsidies of household-level facilities in order to benefit the poor and avoid underutilization of infrastructure

Source: Authors' compilation.

regularly prevent subsidies of large-scale infrastructure from reaching the poor—their intended beneficiaries. Subsidies of investments in household facilities may be delivered in various ways. For example, governments may provide hardware subsidies in cash or in kind, by providing the required construction materials at a reduced cost. They may also facilitate the provision of microfinance, either by serving as a broker within the sector or by subsidizing concessional rates.¹²

The bias against subsidizing household facilities in favor of utility-level infrastructure may reflect politicians' belief that household capital expenditures are a personal responsibility. Also, such facilities, being private, are less visible than large infrastructure, and so are less likely to attract political interest. Another challenge is that subsidies of household facilities are more challenging to implement since they involve various materials (different types of toilets, etc.), suppliers, and contractors, while infrastructure investments center on one large provider—usually a utility.

Policy makers' bias against subsidizing household facilities is particularly notable in the case of on-site sanitation services. Subsidies for these services can be substantiated based on the significant adverse impacts that inadequate household-level sanitation has on community-level health and the environment. Many governments and international donors over the past two decades have focused exclusively on efforts to raise communities' awareness and mobilize their own participation and resources in the provision of on-site sanitation solutions. But these efforts might be more fruitful if complemented by subsidies of household facilities, as discussed in box 3.2.

A problem with subsidies for household-level facilities is that such facilities may benefit landlords instead of tenants, through increased property values. Any resulting increase in rent could force poor tenants, the intended beneficiaries of the subsidies,

to relocate to cheaper housing without access to improved WSS services. Additionally, poor households are the least likely to own land, and may have no legal claim to the land where they reside, which may make them ineligible for any on-plot service investments. Section 4.1 of this report discusses several policy options that may help to alleviate these concerns.

Supply vs. Demand

Schemes focusing on the subsidization of either the demand or supply of water and sanitation have the same end goals: that is, increasing users' access and/or consumption. Their difference lies in how these goals are pursued. As previously described, demand-side subsidies involve a direct transfer from the fund provider to the subsidized user, while supply-side subsidies channel funds through the service provider or another third party, which, in theory, passes the funds on to the consumer in the form of lower prices. The main advantages and disadvantages of a focus on supply or demand are outlined in table 3.6.

Schemes focused on subsidizing the supply side usually involve utilities providing networked water or sewer sanitation; often they benefit from direct transfers or a reduction in the costs of operational inputs or materials. The goal is that the subsidies will be passed on to consumers in the form of lower tariffs. In effect, these subsidies are untargeted, meaning that all consumers are recipients of the subsidized lower price, including even high-income households that could normally afford the service and are willing to pay for it. Since the poorest populations often lack access to the networked/sewered services being subsidized, they are in effect excluded from the benefits.

Other supply-side subsidy schemes entail investments in expanding infrastructure or strengthening supply chains. These are commonly found in countries with low coverage rates. Where they seek to benefit

BOX 3.2. Community-Led Total Sanitation

Community-led total sanitation (CLTS) is a participatory approach to combating open defecation, with the objective of helping communities eradicate the practice of open defecation by changing social norms regarding sanitation. Implemented most often in rural communities, CLTS aims to (i) highlight the poor sanitation practices present in a community; (ii) raise awareness of the role of open defecation in facilitating the fecal-oral route of disease transmission; and (iii) communicate that so long as a small number of people in the community continue to defecate in the open, all community members are at risk. After being educated regarding the negative externalities of open defecation, community members are expected to come up with a coordinated, community-wide solution to increase the ownership and sustainable usage of latrines, including the use of their own resources for latrine construction—a process intended to foster genuine demand for on-site sanitation and a greater sense of ownership (Kar and Chambers 2008). Since its inception, CLTS has been implemented in more than 50 countries all over the globe (Institute of Development Studies n.d.) and is now the main approach used to address inadequate rural sanitation in many low-income countries.

Although CLTS is certainly an important methodology, it is not a panacea. Quantitative evidence suggests that the resulting reductions in open defecation are not always large enough to significantly reduce the existing sanitation access gap. Moreover, the “open defecation free” status achieved by beneficiary communities has not proven sustainable in many cases. Additional policy measures—including targeted subsidies for poor households and support of viable sanitation entrepreneurs to deliver necessary products and services across the sanitation service chain—are generally required to convert the demand for sanitation generated through CLTS into improved sanitation facilities. For example, trials in India and Bangladesh suggest that the benefits of CLTS could be enhanced by complementing it with subsidies for latrine construction that target vulnerable populations (Dickinson et al. 2015; Guiteras, Levinsohn, and Mobarak 2015; Patil et al. 2014; Pattanayak et al. 2009). While low demand for private sanitation unrelated to financial constraints should be recognized as a key factor in explaining the current sanitation gap in some contexts, financial barriers to service access are often equally or more significant, and CLTS on its own can do little to increase the uptake of services. Finally, it is important to consider not only the benefits of CLTS but also its costs, as part of a comprehensive cost-benefit analysis. In particular, attention should be drawn to the hidden costs of CLTS implementation, which according to the few available estimates, are comparable to those of subsidy-driven approaches (USAID 2018a).

Source: Background paper 13 (listed in appendix A).

nonnetworked water or on-site sanitation services, these subsidies are usually directed at supply chains, providers of inputs, and microfinance institutions. Supply-side subsidy schemes are particularly important for on-site sanitation, which requires access to a range of products and services across the sanitation service chain.¹³ A recent desk review of enterprise

development within the sanitation service chain found that continuous external funding and support over a period of four to six years was generally required to achieve scale and profitability (USAID 2018b). An advantage of supply-side subsidy schemes is that they often involve some sort of technology or knowledge transfer to local manufacturers or service

TABLE 3.6. Pros and Cons of Supply vs. Demand Subsidies

Supply subsidies		Demand subsidies	
Pros	Cons	Pros	Cons
• Easier to administer than demand subsidies • May involve technology or knowledge transfer to local producers	• Usually involve a large budget • May reduce service quality and efficiency if receipt of funds is not conditional on performance • Do not allow for proper targeting of intended beneficiaries • May require close monitoring of many providers • Require up-front efforts to gather information on user preferences for service types/features	• Allow proper targeting of intended beneficiaries (poor and marginalized, thus minimizing inclusion and exclusion errors; budget is spent more efficiently)	• May imply high administrative costs • Require good data for good targeting results • May require significant efforts to change consumer behaviors (if existing demand is low)

Source: Authors' compilation.

providers, thus increasing local capacity, and, most likely, productivity and self-sustainability (see, for example, GRDR and GRET 2016). In general, supply-side subsidies for nonnetworked services may effectively target the poor, particularly when they focus on rural areas or urban neighborhoods with homogenously poor populations.

Focusing on the demand side, or consumer, allows for the more accurate targeting of subsidies, increasing their impact on the intended beneficiaries. Various mechanisms can be employed to identify those households that actually need assistance, as elaborated in section 3.5. Effective targeting reduces the funding required to assist the poor as well as the distortions caused by subsidization. Yet it requires some degree of administrative capacity to effectively deliver the transfers to their intended recipients (and thus minimize inclusion and exclusion errors). In some cases, particularly in low-income countries, demand-side subsidies may complement or support programs that promote behavioral change, for example, by raising rural communities' awareness of the importance of household-level water treatment, or the health risks of open defecation. Across the board, in urban and rural areas, changes in behavior may be

required to ensure households' uptake or sufficient use of available WSS services.

Capital vs. Operating Expenses

The decision to allocate funds to subsidize service providers' capital or operational expenditures depends on policy goals and the cost structure of the services being supported. Networked water or sewerage sanitation services have high fixed costs. This in turn makes efficient pricing using marginal costs difficult: such pricing would not allow for full cost recovery, since the marginal costs are lower than the average costs. Capital expenditure (CAPEX) therefore tends to be subsidized in both low- and high-income countries alike. The operating expenditure (OPEX) of poorly performing utilities is most often subsidized in low-income countries. Many nonnetworked water services, as well as on-site sanitation services, entail large, one-time expenditures that preclude the possibility of financing CAPEX through user tariffs. Although CAPEX subsidies for community-level nonnetworked services are commonplace, governments have tried to avoid subsidizing OPEX costs associated with these services. Table 3.7 lists several pros and cons of CAPEX and OPEX subsidies.

TABLE 3.7. Pros and Cons of Subsidies for Capital vs. Operating Expenditures

CAPEX subsidies		OPEX subsidies	
Pros	Cons	Pros	Cons
• Allow for increased service coverage • Time bound (they are usually one-time payments for specific investments, unlike OPEX subsidies, which tend to continue in perpetuity)	• May distort optimal input combination • May result in intergenerational transfers whereby future generations must pay tariffs beyond the economic cost of the assets used	• Easy for governments to implement (in the case of networked services) • May be essential in some areas to ensure service sustainability and protect initial capital investment	• Encourage inefficiency • May distort optimal input combination • May foster overconsumption of water • Directed only at existing users (thus excluding the poorest households that often are without access) • More opaque (than CAPEX subsidies) and difficult to change or repeal

Source: Authors' compilation.

Note: CAPEX = capital expenditure; OPEX = operating expenditure.

CAPEX subsidies may be needed if providers struggle to collect sufficient revenue to recover their CAPEX expenditures, or if network expansion is required to extend access to poor communities that are not perceived as profitable by providers. CAPEX subsidies for both networked and nonnetworked services are seen in not only low-income countries but also in high-income economies such as the United States, albeit generally more limited and better targeted. However, subsidizing CAPEX for users that are already connected (e.g., to support a new wastewater treatment plant where all households already have access to safely managed, sewered sanitation) might entail high errors of inclusion and exclusion.

In many rural areas, CAPEX subsidies are provided to install water points or develop infrastructure for small water schemes.¹⁴ Subsequently, community users are often expected to pay for 100 percent of the OPEX through user fees, and ensure that repairs are covered by that revenue. However, this model may be unsustainable where communities cannot afford to cover OPEX. The problem is widespread—for example, available data suggest that approximately one in four hand pumps in Sub-Saharan Africa are nonfunctional at any given point in time (Foster et al. 2019). This suggests that OPEX subsidies may have a role to

play in sustaining poor rural communities' access to services.

In general terms, whether providers are large utilities or small-scale providers (e.g., water boards, water user organizations), they should aim to at least cover their OPEX with user tariffs to guarantee the sustainability and continuity of services in the short term. However, where the poor cannot afford service, targeted OPEX subsidies that translate into lower user tariffs are merited. Such subsidy schemes usually entail direct budget transfers to providers or, occasionally, lower rates for their operational inputs (such as electricity) or tax exemptions to lower their fiscal burden. Yet while these OPEX subsidies support utilities to keep providing water and sanitation services to all households, they reduce providers' incentives to improve their performance, and often lead to diminishing service quality.¹⁵ Thus, OPEX subsidies should be viewed as temporary instruments that are necessary only where the customer base is unable to afford cost-reflective tariffs, and as the service provider works toward developing better management practices that will sustain an efficient level of service.

OPEX subsidies may be considered where expanding access to sanitation services is a priority. Depending on the context, they may be appropriate

to support the provision of on-site sanitation or “downstream” portions of the supply chain for sewered services. For example, OPEX subsidies could be used to incentivize the frequent emptying of pits/tanks, or the safe treatment and disposal of wastewater. Such efforts would advance the health-related and environmental benefits of proper sanitation.

3.4 Selecting the Funding Source

WSS services are funded by a mixture of revenues from the so-called three Ts: tariffs, taxes, and transfers (OECD 2009). Ideally, services are funded through full cost-reflective tariffs. However, such tariffs are often unaffordable for many households in developing countries. An affordability analysis, as described above in section 3.1, can be used to determine the need for subsidization of access and/or consumption costs. Such subsidization is generally funded through taxes, but in some cases, may also be funded through transfers from international donors or from private charities.

As discussed in chapter 1, WSS subsidies can be funded by either taxpayers (through government) or philanthropic funds, or through cross-subsidization by charging other present and/or future users more than the cost of service (which can include users of an unrelated service subsidizing users of WSS services). The choice of funding will largely be driven by the government’s fiscal space, opportunities for philanthropic funding or concessional financing, and the potential for cross-subsidization across users. For the latter to be a viable option, a sufficiently large proportion of the service’s customer base must be able to afford tariffs exceeding the full cost-reflective price. In some cases, however, governments may facilitate cross-subsidization by users of unrelated services, such as energy, telecommunications, or solid waste collection services. We should also note

the possibility of funding current subsidies through intergenerational subsidies, meaning that future generations will be required to pay tariffs beyond the economic cost of the assets used to provide them the service. Although this practice may potentially be justified under the assumption that future generations would benefit from improvements in income through economic growth, such projections of economic growth are subject to significant uncertainty. We would therefore caution policy makers against the use of such unfunded subsidies.

Each type of funding source (government, other users, or third parties) carries its own risks. Governments may fail to deliver the promised resources. This risk is borne by the customer in the case of demand-side subsidies, or by the utility in the case of supplier-side subsidies. Also, in many cases, subsidies are part of the national budget and therefore must be approved on an annual basis, implying a continuity risk for the funding of long-lived sunk assets. When the subsidy is financed by underpricing an input generated by other sectors, this risk is also present, since the subsidy depends on a government policy that can be changed or reversed. In the case of cross-subsidies, cost recovery requires an estimation of user charges across the customer base to ensure a proper balance between subsidy recipients and cross-subsidizers. The difficulty in conducting this estimation introduces the risk that the subsidy amount may exceed the revenue collected from the cross-subsidizers, thus entailing a deficit.

3.5 Designing the Subsidy

After selecting the policy objective, the target service(s) and/or population(s), and the means of funding, we can now turn our attention to the design of the subsidy itself. As policy makers proceed in designing subsidies, it is important to keep in

mind the characteristics of well-designed subsidies: they should be well-targeted, transparent, and nondistortionary.

In this section, our goal is not to present a comprehensive catalogue of subsidy design options. Instead, we highlight three key strategies that have proven, when well-designed and implemented, to improve the efficacy and efficiency of subsidies: (i) using alternative approaches to improve targeting, (ii) making subsidies conditional on performance, and (iii) decoupling subsidies from service charges.

Improving Targeting

As discussed in chapter 2 (section 2.3), common methods of targeting WSS subsidies have generally been ineffective at directing scarce public resources toward their intended beneficiaries—the poor. Increasing block tariffs, one of the most common targeting tools, have proven particularly ineffective on account of two main problems (see box 2.1, chapter 2). First, the poor often lack access to services to begin with, so they do not benefit from the lower, subsidized rates. Second, there is no direct correlation between piped water use and income (Fuente and Bartram 2018). In other words, a low-income household may consume a large volume of water, especially if it shares a single point of service connection with several other households, as is common among the poor.

There are three main approaches that may be used to better target WSS subsidies to the poor, the appropriate mix of which will depend on local conditions:

1. Subsidize poor households' connection/access to WSS services.
2. Better identify poor households requiring consumption subsidies through administrative selection.
3. Provide a range of types of WSS services that are better suited to reach everyone.

As described in section 3.3 of this chapter, access subsidies are warranted in contexts where connection rates are low, where the poor in particular lack WSS household connections, and where sufficient infrastructure

exists to service their neighborhoods. In such circumstances, a lack of connection serves as a proxy for poverty, and its use as an eligibility criterion for subsidization reduces errors of exclusion and inclusion. However, the connected poor, whatever their numbers may be, often require additional support beyond one-time connection subsidies. In these cases, well-targeted consumption subsidies are also required.

Administrative selection involves categorizing and identifying potential recipients, in an attempt to effectively deliver subsidies to those households that need them most. Means-tested subsidies, which aim to benefit particular categories of consumer groups, are among the most successful at minimizing both errors of inclusion and exclusion. These aim to identify households' ability to afford water through the use of income or expenditure data. Because of the substantial amount of data required and the related high administrative costs, means-tested subsidies may appear cost prohibitive for many low-income countries. However, these administrative costs can be significantly reduced through the use of innovative technology or by sharing such costs with other government programs that seek to target benefits to the poor. For example, a national socioeconomic survey in Chile has been used to inform policy in several sectors (Serra 2000).

Where the administrative capacity or funds to implement means-tested subsidies are unavailable, a readily observable factor strongly correlated with poverty (e.g., location) may be used as a basis for targeting.

Subsidies should be well-targeted, transparent, and nondistortionary.

Where the poor are concentrated in particular neighborhoods, governments and service providers can direct subsidies using geographic targeting by implementing reduced tariffs in certain neighborhoods. This type of targeting method is usually cheaper than means-tested schemes, although inclusion and exclusion errors are unavoidable since completely homogeneous neighborhoods (in terms of monetary income) are extremely rare.

Another way to target low-income consumers is to provide different types of WSS services at different price points. The most common service-level targeting involves the installation of public water taps. These taps are usually built in low-income neighborhoods without high rates of networked water consumption, whether because of a lack of necessary infrastructure, or because the average household income does not allow for a household connection (or a basic level of water consumption via a household connection).¹⁶ While setting up public taps usually allows households in the vicinity to consume basic levels of water, the risk of contamination rises as water is transported from the tap. Additionally, households are required to invest a significant amount of time in fetching water, and may also incur additional expenses for household-level water storage and treatment. Community-level toilet blocks, constructed to provide the poor or particularly densely populated neighborhoods with a short-term sanitation solution, offer another common example of a differentiated service type.

Where networked water or sewerage services are provided at the household level, technologies can be

employed to reduce the cost of provision faced by the service provider, thus allowing for reduced tariffs. An example is the use of restricted-diameter

connections, low-pressure systems, and electronic flow-limiters in the relatively high-capacity setting of Durban, South Africa (Brocklehurst 2001; Heymans et al. 2016). Since the choice to opt for a lower service level is likely to be correlated with poverty, subsidies can then be targeted to these customers, further reducing their tariffs.

Finally, we must call attention to new and innovative approaches to targeting that are made possible by continued improvements in technology. For example, the use of remote sensing and street view data, coupled with machine learning algorithms, is currently being piloted by the World Bank to develop a poverty map of the city of Luanda, Angola, that could then be used to target subsidies to the poor (World Bank Group 2019).

Making Subsidies Conditional on Performance

As discussed in chapter 2 (section 2.5), the characteristics of networked water and sewerage sanitation services make service providers susceptible to a vicious circle whereby low prices lead to losses, postponement of required maintenance investment, and hence even higher costs down the road, leading to yet more losses. In order to stave off the severe social costs of service interruptions, public authorities tend to heavily subsidize service providers, which weakens fiscal discipline due to perverse incentives that encourage the padding of costs, condone inefficiency, and disregard service quality. One alternative is to divert public resources to demand-side subsidies, which avoid this vicious cycle by maintaining the service provider's accountability to its customers, since revenue collection depends on the provision of high-quality service that customers are willing to pay for.

However, inefficiencies stemming from supply-side subsidies are not inevitable—instead, it is possible to avoid such inefficiencies by conditioning subsidies on well-crafted performance targets that are tangible,

Inefficiencies stemming from supply-side subsidies are not inevitable.

transparent, verifiable, and under the service provider's control. Performance- and results-based contracts can be used in both public-public or public-private contracts to improve performance by linking subsidies not to individual expenditures, but rather to the timely and quality delivery of verifiable outputs or results (Mumssen et al. 2018).

Key performance indicators, developed by the government or regulator, may include standards for service continuity and water pressure; nonrevenue water reduction; service connections, meter installation, or service repair schedules; the volume of waste treated or reused; or the resolution of consumer complaints.

For example, a World Bank-financed project in a part of Ho Chi Minh City, Vietnam used a performance-based contract approach to greatly reduce nonrevenue water (Chen 2018).¹² Output-based aid instruments supporting the construction of facilities to expand access, such as water connections for the poor, have proven particularly successful in many countries—including Colombia, Kenya, Morocco, the Philippines, and Uganda—on account of their transparency. Performance contracts are most effective when they include simple agreements, clear responsibilities, realistic targets, reporting requirements, and monitoring and auditing arrangements (World Bank Group 2018e).

Decoupling Subsidies from Service Charges

The decoupling of subsidies from WSS access and consumption charges through the provision of cash transfers, whether conditional or unconditional, has the potential to improve the efficiency, transparency, and targeting of WSS subsidies. By avoiding the use of the service provider as an intermediary, cash transfers avoid the distortionary impacts on service providers previously discussed in chapter 2 (section 2.5). This is because the service provider can collect the cost-reflective tariff directly from each customer,

providing it with a market-driven revenue stream sufficient to fund its operations and maintenance activities. The service provider remains accountable to meeting the needs of the customer, since it

cannot depend upon direct transfers from the government to make up any funding gaps. Its only way to capture the subsidy is by servicing the cash transfer recipients at a desirable level of quality. Since cash transfers are generally blind to the service provider, households can opt for alternative means of supply if the utility is either not servicing the area or is providing a substandard level of service. Therefore, networked utilities have the incentive to extend service out to poor neighborhoods, which, in receiving the cash transfers, can now afford the service.

By decoupling subsidies from the service itself, the targeting of WSS subsidies is improved in contexts where a significant proportion of poor households lack access. As discussed in chapter 2 (section 2.5), the poor targeting performance of most WSS subsidies in place today arise mostly from factors related to access. In order to benefit from subsidies delivered through the service provider, a household must be consuming that service. Through the use of cash transfers, poor households that either live outside of the provider's service area or are unable to connect can now benefit from the subsidy.

However, providing subsidies through cash transfers does not guarantee that households will use those subsidies for the intended purpose, unless they are provided through vouchers or made conditional on the payment of WSS bills. Vouchers may stipulate that they be used only toward paying for piped water and sewerage sanitation, or for alternatives like water ATMs, prepaid service, water tankers, and so on. They may also leave the household free to choose its

*Cash transfers
avoid distortionary
impacts on service
providers.*

service provider, as long as the vouchers are used toward WSS services. Yet despite the apparent benefit of ensuring that cash transfers are used toward improving WSS services for their recipients, an economic argument can be made against the use of such conditions, as they restrict the choice of the consumer, thus reducing gains to welfare.¹⁸

There are several examples of decoupling subsidies from WSS tariffs and charges. One of the most well-known multisector cash transfer programs is Brazil's Bolsa Familia program, introduced in 2003, that uses a social registry to target conditional cash transfers to eligible households (ECLAC 2016). A decade prior, in the early 1990s, Chile sought to improve the targeting of subsidies through a means-tested subsidy scheme after new regulatory frameworks compelled utilities to charge cost-reflective tariffs. Although this was not a cash transfer per se, Chile effectively decoupled the subsidy from the tariff by billing a portion of the user's charge directly to the municipal government (Contreras, Gomez-Lobo, and Palma 2018). More recently, the Iranian government has introduced compensatory cash transfers in its efforts to raise energy and water tariffs to cost-recovery levels over the past decade (see box 4.1, chapter 4).

Notes

1. Stalled reforms are particularly informative. In these cases, a political coalition may have successfully supported reform legislation but later proved insufficient to see it implemented. These situations bring to light specific modifications to the reform process that might enable a better outcome.
2. A subsidy reform package includes phases in the rollout of the subsidy reform itself, as well as additional elements such as complementary sector or legal reforms, policies to temporarily compensate users for loss of benefits, communication strategies, and so on.
3. See background paper 12 (listed in appendix A) for an application of this model in Nigeria.
4. As recognized by the UN General Assembly and the Human Rights Council in Resolution 64/292 in 2010, and then again by the General Assembly in Resolution 70/169 in 2015.
5. SDG 6: "Ensure availability and sustainable management of water and sanitation for all."
6. For example, as shown by Cronin et al. (2017), a certain threshold of sanitation usage (e.g., 60 percent) may be required in a community in order to see health benefits. Coverage levels below this threshold may not result in substantial gains. Thus, a household is unlikely to reap the benefits of ending open defecation unless the majority of its neighbors do so as well, whereas a household whose members are still defecating in the open will reap the benefits if most of their neighbors give up the practice. This is consistent with findings that suggest strong positive externalities of toilet coverage and strong negative externalities of open defecation (see, for instance, Gertler et al. 2015).
7. Data refer to 2015 values and were extracted from <https://washdata.org/data>.
8. Rural water supply is often facilitated through "basic systems," which include hand pumps, spring collectors, gravity feeding systems, rainwater harvesting, storage tanks, and small distribution systems that usually involve shared connections. Urban systems employ water pumps and neighborhood networks, including those with shared connections. Basic sanitation systems include on-site disposal systems and latrines. In some cases, household- or community-level investment in such systems may be promoted.
9. As seen in background paper 3 (listed in appendix A), current consumption subsidies for networked services tend to be regressive.
10. According to the American Water Works Association (AWWA 2015), water quality may decrease when low consumption reduces the speed of water in a system to below 1 meter per second (m/s) on average per day (1 m/s is required by the standard ANSI/AWWA C651-14). Slow-moving water reacts with piping material to become discolored, turbid, and smelly. Customers' poor perception of such water can lead them to reduce their consumption, and may discourage potential customers from connecting, reducing revenue from water sales. With regard to wastewater networks, a minimum flow rate of 1.2-1.5 m/s is generally required to prevent the clogging of gravity-fed networks and/or ensure the proper functioning of pumps in pressurized networks.
11. See, for example, background paper 3 (listed in appendix A) and Komives et al. (2005).
12. For further details on these and other mechanisms, please refer to background papers 4 and 8 (listed in appendix A).
13. The sanitation service chain includes all products and services required for the processes of containment, emptying, conveyance, treatment, and disposal/reuse. See background paper 11 (listed in appendix A) for an overview of potential subsidy structures.
14. See background paper 8 (listed in appendix A).
15. CAPEX subsidies can be loosely associated with connection subsidies and OPEX subsidies with consumption subsidies, although

for networked/sewered services, it is difficult to determine whether general transfers from the government to utilities are earmarked for CAPEX or OPEX unless specific clauses or regulations exist.

16. Even if the tariff charged by the utility at public water taps is less than that charged for household connections, the tariff paid by the end user may, in fact, be higher if the taps are run by private groups or individuals that charge a significant mark-up. In Kampala, Uganda, the utility has taken efforts to reduce or eliminate such mark-ups by either further reducing the tariffs charged to the operator, or cutting out the middleman through the use of electronic tokens (Heymans et al. 2016).

17. With more than 8,000 connections replaced and leaks fixed in over 600 kilometers of pipe, leakage was reduced by almost half. The water saved could serve 500,000 people—half of the population in the performance-based contract area (Chen 2018).

18. Microeconomic theory states that conditional cash transfers make people better off than a subsidy for specific goods or services, even if both are worth the same money. This is called “the lump sum principle”; specifically, “an income tax or subsidy leaves the individual free to decide how to allocate whatever final income he or she has [while] taxes or subsidies on specific goods both change a person’s purchasing power and distort his or her choices” (Nicholson and Snyder 2008).





CHAPTER 4

Designing an Effective and Efficient Subsidy Reform Package

Subsidies do not function in isolation: any well-designed subsidy requires a number of additional elements to facilitate its acceptance and improve its efficacy in both advancing equitable access to affordable water supply and sanitation (WSS) services and harnessing positive externalities. Alongside subsidy design, four elements—namely, complementary policy mechanisms, a strategy to foster a supportive political coalition, a communications strategy, and an exit strategy (when applicable)—are critical to consider when creating a subsidy reform package.

4.1 Mechanisms to Complement Subsidies

Poor households are hard to reach using traditional WSS delivery mechanisms due to a range of factors. Expanding service networks is itself difficult in some geographic terrains, or amid the chaos of unplanned and congested settlements. Poor households often consume relatively small quantities of water, and those in rural areas may be widely dispersed. These and other factors discourage service providers from investing in poor households' access to networked WSS services.

This section aims to discuss various complementary policy mechanisms that may be used to complement subsidies, with the aim of improving WSS services' access and affordability for the poorest segments of the population. Table 4.1 provides a nonexhaustive list of types of subsidies and some complementary policy mechanisms that can be used to reduce the amount of a subsidy that may be required to improve WSS services for the poor. They are split into two categories, based on their goal of either (i) improving access or (ii) ensuring a minimum level of consumption, although both categories are linked and can be difficult to analyze separately.

TABLE 4.1. Subsidies and Complementary Policy Mechanisms for Improving Access and Consumption

Priority	Types of subsidies	Complementary mechanisms
Access	• For providers' capital investment • For consumers' initial costs and connection charges	• Community-based resource management, and small-scale providers (demand-responsive approach) • Expansion of service access linked to employment programs • Community empowerment programs • Alternative technologies • Home-based systems • Microfinance • Removing legal and administrative barriers for the poor
Consumption	• Cross-subsidies • Social tariffs • Increasing block tariffs • Volume-differentiated tariffs • Administrative selection • Targeted vouchers and cash transfers	• Mechanical public standpipes and water-vending machines • Payment and billing technologies • Smart metering and prepaid water systems • Improved management and operations

Source: Authors' compilation.

Mechanisms that Prioritize Access

The first two complementary policy mechanisms we consider seek to increase access to WSS services by reducing the costs associated with service provision.

The first of these is a demand-responsive approach pioneered by water boards in rural Paraguayan communities that aims to reduce management costs through community engagement. Nonprofit associations of users take full responsibility for the management of their WSS systems, including monthly billing to cover their operations and maintenance expenses, and have proven successful in expanding households' access to more sustainable and better-quality services (OVE 2016).¹ Emerging evidence suggests that such alternative mechanisms, involving small-scale systems, are indeed more effective than traditional supply-driven models in reaching rural and peri-urban areas, and hence a large proportion of the poor (OVE 2016; Andres et al. 2017). The second mechanism, implemented in several countries,

including Argentina, seeks to reduce the capital expenditures required to expand access—while simultaneously addressing unemployment and social exclusion—by providing training and jobs in the construction of required infrastructure.²

In areas where traditional piped-water and sewerage systems are not feasible, innovative or alternative technologies can be used to simultaneously expand access and empower communities. For example, Sulabh, an Indian social service organization, has coupled public toilets with biogas digesters (and effluent treatment systems) that fully recycle human waste, improving the potential for financial sustainability while simultaneously reducing communities' reliance on waste scavengers. The technology is simple enough to be implemented by locally trained members of the community, and all materials are locally sourced (Sulabh International 2016, 2018 1001 Fontaines n.d.). Where households lack access to water supply on premises, inexpensive point-of-use

water treatment, such as chlorination and filtration, are effective interim solutions to expand access to potable water by reducing the risk of water-borne illnesses stemming from contamination either at the source or during transport from source to home (Clasen et al. 2015).

Finally, microfinance loans can assist the poor in overcoming their lack of credit and resources to cover the large up-front connection charges associated with access to networked/sewered services, as well as the large up-front initial costs associated with nonnetworked/on-site services (Water.org 2018). A number of WSS microfinance programs around the world have demonstrated that many poor households are not only willing to take loans to finance their WSS assets but also consistently repay these loans (Water.org. 2018). A well-known example is that of Bangladesh's Grameen Bank, which has successfully reached rural populations with affordable loans for water and sanitation, specifically targeting women (Khandker, Khalily, and Khan 1995). Another example is in Vietnam, where many women's unions have helped households to invest in their own toilets through a revolving fund initially capitalized by multilateral funds (Trémolet, Kolsky, and Perez 2010).

Removing Legal and Administrative Barriers to Access for the Poor

Informal settlements and a lack of land titles represent significant barriers to expanding poor households' access to networked WSS services. In many countries, WSS service connections are seen as a means for inhabitants of a particular property to stake a legal claim to its ownership. Governments, fearful of this implication, may hesitate to provide such connections. Moreover, since voting rights can be conferred on the basis of land ownership, inhabitants without land titles lack sufficient bargaining power to demand change from their political representatives. Providing

land titles, therefore, is often a necessary prerequisite to extending access to networked WSS services in such communities. Meeks (2018) investigated the effect of a land-titling program in Peru and found small but statistically significant increases in access to water supply, mostly

driven by increased investments in infrastructure by the government or water utility, as opposed to by individual households (Meeks 2018: 345-57).

Service providers themselves face significant technical and administrative challenges when expanding service into unplanned peri-urban communities; the lack of property demarcations makes the installation of pipelines difficult, while the lack of an official address system hinders payment collection (Meeks 2018: 345-57). The terrain and the absence of public rights of way pose significant engineering challenges to traditional network construction.³ A lack of compliance with building codes, zoning ordinances, and other standards further complicates installation and increases the risk that service investments will not be viable in the long term.

In both informal and formal settlements, ensuring that current tenants benefit from improvements in access to WSS services, as opposed to relatively well-off landlords, proves challenging. Tenants, often among the poorest and most vulnerable (Eales and Schaub-Jones 2005), are often underappreciated by regulators or policy makers due to inaccurate tenant estimates stemming from difficulty ensuring accuracy in censuses and surveys and even intentional underreporting by landlords. Also, when access to improved WSS services is expanded, landlords may use this as an opportunity to increase rents. For some

Informal settlements and a lack of land titles represent significant barriers to expanding poor households' access to networked WSS services.

tenants, this represents an untenable financial burden that forces them to move to more distant and/or inadequate housing. New WSS services thus do not reach their intended beneficiaries (WSUP 2013). Thus, due to a combination of political, technical, and administrative hurdles, tenants and households without secure land titles may be effectively excluded from a network, even where they might be able to afford (possibly subsidized) services.

Aside from addressing the issue of land tenure directly, Water and Sanitation for the Urban Poor (WSUP 2013) proposes several policies to improve tenants' access to WSS services. These include the provision of conditional subsidies for the construction of private or shared sanitation facilities, the revision and enforcement of rental housing bylaws, and the use of service models appropriate to areas with high tenancy rates. In Naivasha, Kenya, for example, subsidies of shared sanitation facilities prioritize live-in landlords, who have a greater stake in investing in services than do absentee landlords, and landlords are required to ensure that their tenants have full access to the subsidized facilities. In Nairobi, Kenya, landlords in some informal settlements were required to give up a percentage of their land for the subsidized construction of improved WSS infrastructure. In Antananarivo, Madagascar, new rental housing bylaws require landlords to provide sanitation facilities to their tenants. Finally, shared services that are provided on a pay-per-use basis allow users to access the service without prior investment and regardless of their tenure status (WSUP 2013).

Mechanisms that Prioritize Consumption

Several measures that may be used to complement consumption subsidies help service providers more effectively target subsidies to the poor. Among the most common such measures in low-income

countries is the provision of water supply through coin- or card-operated public standpipes or water-vending machines. Both options, which tend to be used overwhelmingly by the poor, typically offer water at a cheaper price than the tariffs charged for household connections, while avoiding the management costs that would be entailed by hiring attendants to manage service provision (WUP 2003).

Meanwhile, the connected poor face significant financial constraints to paying their water bills, including unpredictable and often seasonal income. Many would benefit from shorter, frequent billing cycles (Komives et al. 2005) and flexible payment systems (that utilize mobile phones, for example, or payment kiosks in nearby towns) (Hope et al. 2011). Also important, smart metering and prepaid water technologies allow consumers to be more aware of their real-time water usage and charges and adjust their consumption accordingly (Heymans, Eales, and Franceys 2014).

Improved Management and Operations

The overstaffing and water production losses of networked water and sewered sanitation services cost low- and middle-income countries, excluding China and India, over \$37 billion in subsidies each year.⁴ Our estimation of global subsidies for networked water and sewered sanitation allows us to quantify the percentage of subsidies directly attributable to inefficiencies in staffing and water production losses, as well as the additional capital expenditure (CAPEX) required for the excess production needed to cover these losses, as well as overconsumption resulting from subsidized pricing. According to our estimates, approximately 7.8 percent of operating expenditure (OPEX) subsidies and 13.8 percent of CAPEX subsidies in low- and middle-income countries, excluding China and India, can be directly attributed to these inefficiencies. Because of data constraints, this

estimate does not even include the costs associated with other management efficiencies, including low billing and collection rates, and subpar maintenance.⁵

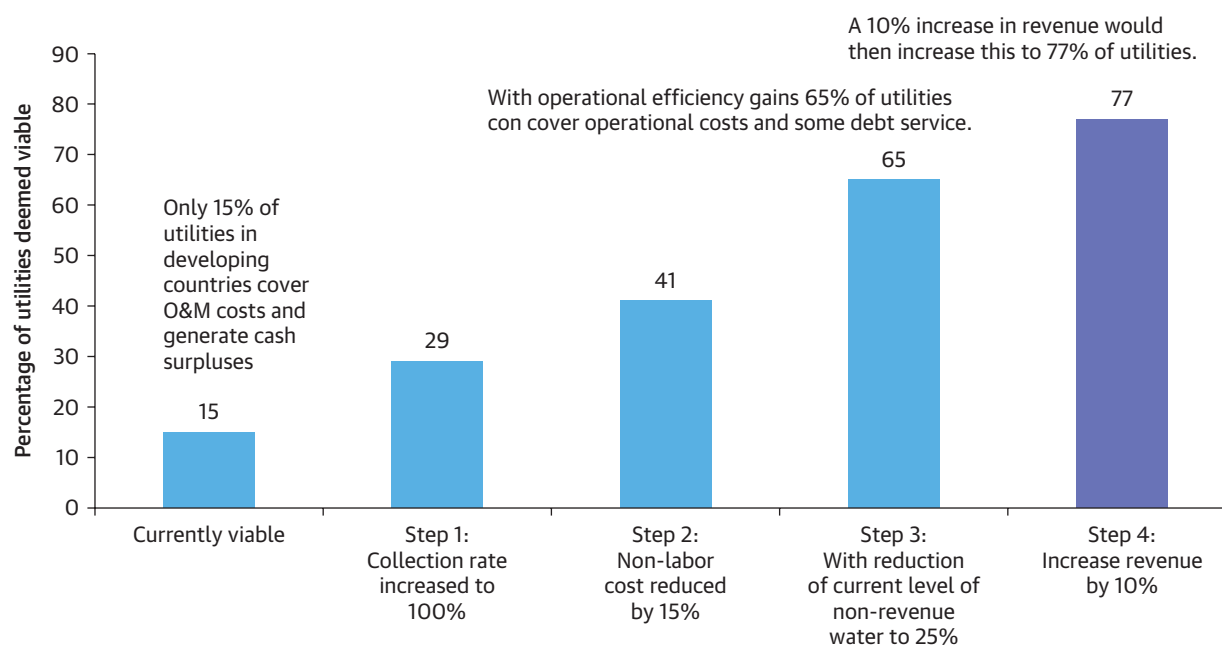
In fact, a World Bank study (Goksu et al. 2017) found that, without even attempting any tariff reforms, operational efficiency gains alone would bring 65 percent of the 690 utilities included in the study to financial viability, defined here as the recovery of 120 percent of operating costs. These efficiency gains involve four measures to cut costs and bolster revenue (figure 4.1).

With that said, improvements in capital expenditure efficiency may be as important to financial viability as improvements in operational efficiency. In developed countries where utilities account for the full cost of service delivery, debt servicing required to repay loans for capital costs amount to nearly half of total costs.⁶ A number of strategies, including strategic

planning, the use of simple, robust, and low-cost technology, optimized project design and management, efficient procurement, effective capital maintenance, incentive-based approaches toward capital expenditure efficiency, and end-use demand management can result in capital savings in the order of 25 percent or more, allowing existing investment to deliver a 33 percent increase in benefits (Kingdom et al. 2018).

Beyond direct cost savings, efforts to improve operational efficiency complement tariff reform in other significant ways. When operations are more efficient, service providers are better able to set realistic tariffs that reflect service quality while being more affordable. Customers are willing to pay more for better service, especially if they have been footing the bill for inefficient delivery in the past. Moreover, by strengthening the link between service quality

FIGURE 4.1. Efficiency Improvements that Help Utilities Reach Financial Viability



Sources: World Bank calculations based on IBNET data; Goksu et al. 2017.

Note: Estimates from data on 605 utilities in low- and middle-income countries. IBNET = International Benchmarking Network for Water and Sanitation Utilities; O&M = operation and maintenance.

and revenue, providers are encouraged to be more customer oriented: the better they understand their customer base, the better able they will be to make appropriate improvements.

Therefore, as noted in the World Bank's Utility Turnaround Framework, any sector turnaround should begin with making service providers' current operations and capital investments more efficient (Soppe,

Janson, and Piantini 2018).

Any sector turnaround should begin with making service providers' current operations and capital investments more efficient.

Greater efficiency, in turn, can encourage governments to allocate additional resources to the sector, if necessary, while encouraging private sector investment through an improved risk-reward balance (as discussed later in this section).

Experience shows that such reforms can be quickly implemented from a technical perspective but they first require a government champion to assert direct leadership in championing reforms and a catalyst that creates space for change. Catalysts vary by context but most commonly involve a crisis, such as chronic water shortages or severe financial distress, or a political decision that pushes service providers toward reform. This kind of political decision might involve (i) a political threat to streamline the service provider, thus threatening the livelihood of the service provider's staff, (ii) a loss of subsidies, or (iii) a change in sector governance frameworks that provide incentives for reducing costs and increasing revenues (Soppe, Janson, and Piantini 2018). For example, governments likely need to authorize service providers to collect bills and give them the autonomy to restrict service to nonpaying customers. Such reforms in the early 2000s greatly improved the performance of service providers across Vietnam, including in the city of Da Nang,

where between 2005 and 2014 a water utility more than tripled its connections (14,000 of new connections involved the urban poor), reduced nonrevenue water to 17 percent, and lowered energy costs by 23 percent (Goksu et al. 2017).

Facilitating Access to Commercial Financing

Although commercial financing is a separate issue from the funding required for subsidies, it represents a significant opportunity for service providers to rehabilitate or expand their infrastructure to meet the needs of current and future users. Commercial financing allows service providers to effectively distribute the costs of such infrastructure across current and future generations, ideally in a manner whereby each generation of users pay the economic costs of the assets that they are responsible for.

The higher targets and new baseline of SDG 6 require investment estimated at \$1.7 trillion in water and sanitation between 2015 and 2030 (Hutton and Varughese 2016)—a significant challenge for many low- and middle-income countries, given the WSS sector's poor cost-recovery record, dependence on public funds, and low and uncertain fiscal transfers (World Bank Group 2017a). Additionally, the WSS sector in many low-income nations suffers from underfunding as governments struggle with competing public expenditure priorities and a fast-growing urban population. To bridge the gap between current levels of WSS service and the SDG 6 targets, existing funding from governments and development partners will have to be supplemented. In addition to more public expenditure in the sector, another potential way forward is to leverage private resources through the strategic deployment of available subsidies.

Leveraging private resources in the WSS sector can be very challenging, since private sector investors must meet their obligations to shareholders and generate acceptable returns, compatible with the risks accepted. Funding needs are characterized by large

initial public outlays, relatively long design periods (which, in turn, postpone the point at which revenue starts to flow), and modest returns, given that water is often considered a basic need and social service rather than a pure economic good. As a result of these challenges, the sector largely depends on poorly designed subsidies, which may give rise to a host of problems, including financial and technical inefficiencies, such as inadequate management and overstaffing. These in turn impact creditworthiness and ultimately inhibit private sector investment. However, it is possible for development partners and governments to use their own limited resources, particularly through the judicious use of grants and concessionary funds, to improve both the operational and financial performance of service providers and leverage more investment from the private sector.

Private investors are driven by a “risk-reward balance,” irrespective of the sector they fund or invest in.

In other words, the higher the risk, the higher the required expected return, until a point at which the investor determines that the risk is too great and is no longer willing to invest. To encourage private sector investments, the risk-reward balance must be acceptable to both investors and recipients. When it isn't, the public sector can influence the private sector's willingness to invest by either increasing the reward or decreasing the risk.

Blended finance, defined by the Organisation for Economic Co-operation and Development as “the strategic use of development finance for the mobilization of additional finance toward sustainable development in developing countries,” specifically seeks to improve the risk-reward balance by either de-risking projects or enhancing returns (OECD 2018). Subsidies can serve several different roles in such blended finance transactions, including the following examples.

- **Capital contributions/grants** effectively reduce the initial capital costs of a project. This in turn reduces

the time frame of cost recovery, since capital costs are ultimately collected through service charges. Thus, such contributions help reduce the service charges paid by individual consumers, the availability charges paid in a public-private partnership (PPP), or loan repayments required in a private loan.

- **Concessionary loans** reduce the interest rate payable on the project cost and thus the overall amount to be repaid, generally through the collection of service charges.
- **Operational contributions** cover the running costs of operating and maintaining the utility, which in turn subsidizes service charges. Operational contributions (sometimes called viability subsidies) are the most common way to subsidize utilities to make them creditworthy, although they tend not to attract a lot of private capital, primarily because of their irregular and unreliable nature.
- **Grants to improve capacity** are temporary subsidies that reduce the cost of running the utility and help achieve more efficient and effective service provision in a financially sustainable way. It is important to note that access to commercial financing requires that service providers receive a reliable flow of resources, primarily through user tariffs. Such grants can help improve capacity to achieve this by implementing uniform billing systems, implementing metering systems, standardizing approaches to GPS (global positioning system) mapping, and so on.
- **Financial guarantees against default with fees set below market rates** do not fully reflect the risk involved. The difference between the market-based cost of the guarantee and the actual cost charged would constitute a quantifiable subsidy.
- **Nonenforcement of standards:** Should the set standards of a public-private partnership project, whether a concession or a delegated management contract, deliberately not be enforced, it will

represent a cost savings to the private operator and thus an indirect subsidy.

- **Tax concessions** are an additional hidden means of providing a subsidy. They have two forms: the government may either (i) waive existing taxes, such as value-added taxes; or (ii) provide tax incentives or waivers to investors.
- **Waiving dividends or returns on equity:** In most cases where a utility is established as a company or a separate state-owned enterprise, it is capitalized by the public sector without any expectation of a dividend or return on capital, effectively constituting a subsidy.

4.2 Building Political Coalitions to Support Reform

A strategy to both foster supportive political coalitions and mitigate the impact of opponents is an essential element of any reform.⁷ Broad and diffused interests tend not to be well organized, whereas concentrated interest groups can mobilize more readily and effectively to advance their narrower causes. This basic logic is behind a simple political economy framework that categorizes the political equilibrium of a country's subsidy policy (table 4.2) along two axes: (i) the size of benefits accruing to all households or individuals in the population (generalized benefits); and (ii) the size of benefits accruing to only particular

segments, or interest groups, within that population. It is important to note that an interest group can be any group with a stake in the system; that is, either intended beneficiaries (such as the poor) or unintended beneficiaries (such

A strategy to both foster supportive political coalitions and mitigate the impact of opponents is an essential element of any reform.

TABLE 4.2. Characterizing Subsidy Policy Benefits: Basic Framework

	Generalized benefits are large	Generalized benefits are small
Interest group benefits are large	Case 1	Case 2
Interest group benefits are small	Case 3	Case 4

Source: Adapted from Inchauste, Victor, and Schiffer (2018: 11).

as the rich who may disproportionately access networked services, or service providers or government actors profiting from inefficiencies in the system). (These dimensions are consistent with the life-cycle diagram presented in box 2.2 in chapter 2.)

Ultimately, the goal is to understand how interest groups might support or oppose government efforts toward subsidy reform.⁸ This will depend on the level of organization and political power of the groups concerned, as well as the ability of reformers to choose political allies and to weaken or even win over the political influence of groups that could potentially block a proposed reform's implementation.

A subsidy reform may seek to shift this equilibrium, but of the four cases outlined in table 4.2, none is preferable in all contexts. For example, a well-targeted subsidy that seeks to exclusively benefit the poor should strive toward case 2, while a reform program seeking to gradually remove subsidies in order to attain cost-recovery tariffs should strive toward case 4. Note that only those situations where costs accrue largely to the government (taxpayers) while benefits accrue to interest groups and the general populace are considered in these four cases. In reality, the costs borne by citizens and interest groups would need to be considered in any comprehensive political economy analysis.

To design feasible reforms and implementation plans, it is crucial to figure out the current political equilibrium in a country and to develop a strategy for

how to shift the status quo. For example, when generalized benefits and benefits accruing to interest groups are both large (case 1), the following may improve the feasibility of reform:

- The government communicates a strong, simple, and credible narrative, outlining the risks of the status quo and breaking complex economic processes down to a simple relatable logic.
- Citizens develop a better understanding of how the existing system is harmful to their interests—by, for example, effectively redistributing public funds to the wealthy—and mobilize to counter it.
- The government credibly commits to citizens and interest groups that policy reforms will leave them either better off or the same. This may require offering them medium-term benefits to offset the loss of subsidies.
- Interest groups that would oppose reform find it difficult to mobilize, or the government finds a way to satisfy their core aims.
- The costs of providing benefits rise sharply (e.g., because of a fiscal crisis or impending water security crisis).
- The costs of subsidies are not sustainable, coupled with declining service quality.
- External pressure from donors or lenders changes the political equilibrium.

A detailed description of each type of case, as well as possible strategies for reform in each context, is provided in appendix C.

4.3 Communications Strategies for Reform

International experience has shown that a well-planned and professionally executed communications strategy, based on empirical research, is critical to the success of WSS subsidy reforms. Public reactions to subsidy reform programs are highly contextual and dynamic.

Reforms are successful only where an informed and supportive public understands the rationale for reform.

Communication is a necessary investment that should be planned and implemented by profes-

sionals before, during, and after a reform's implementation. By assessing risks and opportunities early, informing the public in accessible and engaging ways, and helping people understand the benefits of subsidy reform and how these link to their own lives, policy makers can encourage public understanding—and, ultimately, goodwill.

A well-planned communications strategy must also be flexible to accommodate shifting political, social, and cultural factors relevant to the reform process. Planners should take the following steps:

- Clearly define the strategy's primary goal, characterize the political and socioeconomic context in which it will be developed, and understand what makes the reform urgent as well as the possible obstacles to its implementation.
- Map the relevant stakeholders by category and deepen understanding of their views, feelings, perceptions, motivations, beliefs, and practices by conducting opinion research, focus groups, in-depth interviews, and so on.
- After internalizing how the target audiences think, feel, and may react, create compelling messages that harness the power of emotion and storytelling, define credible messengers, and select appropriate channels of communication.
- Implement a “monitoring-evaluation-learning” process to gauge the impact of the campaign and adjust the strategy if and as required.

Reforms are successful only where an informed and supportive public understands the rationale for reform.

BOX 4.1. A Successful Communications Strategy: The Case of Iran

In March 2010, the Iranian parliament ratified the Targeted Subsidies Reform Act, establishing a gradual increase of energy and water prices to attain full cost recovery, along with the gradual elimination of a variety of agriculture and transportation service subsidies, within a five-year period (2010–15). In parallel, the government replaced the subsidies with compensatory nationwide cash transfers.

The Government of Iran implemented a communications campaign before the subsidy reform to help build public support. The authorities emphasized the social inequity resulting from cheap energy (Guillaume, Zytek, and Reza Farzin 2011: 17). The communications campaign increased consumers' awareness of the potential price increases and demonstrated how the reform would support poor and vulnerable households not benefiting from the current subsidy system. The campaign clearly communicated that subsidies would not be eliminated completely, but instead redirected to specifically benefit poor households. The government used a series of messages to communicate how the reform would: (i) improve standards of living, (ii) distribute national wealth fairly and equally, (iii) minimize income disparities, and (iv) increase efficiency and prevent wasteful consumption, among other benefits.

The reform was preceded by an extensive public relations campaign to educate the population on the growing costs of low energy and water prices and on the benefits expected from the reform. The government appointed a special spokesman to coordinate the envisaged public relations campaign in support of the reform. Through a broad range of educational programs, news media (newspapers, websites, radio, and television), and public seminars it was explained how energy waste resulted from low energy prices. Political, business, and social leaders, as well as academics, were mobilized to speak in favor of the reform and enumerate its benefits (Guillaume, Zytek, and Reza Farzin 2011: 17). To make the process transparent, utilities exposed Iranian households to the new prices well before they were implemented, sending them bills that foreshadowed the true unit cost and the full amount due after reform, in addition to the current subsidized rates.

Overall, the public relations campaign proved successful, owing largely to the following elements: (i) strong political will to reform subsidies; (ii) a unified and coherent message; (iii) well-organized pre-reform preparations to attract public support; (iv) excellent communication of the impacts of subsidies, energy price increases, and expected benefits; and (v) efficient messengers using the right channels. Despite the initial success, the subsidy reform program was later derailed due to the progressive imposition of economic sanctions and successive economic shocks, which reduced the real value of cash transfers and pressured the government to reintroduce some subsidies (Salehi-Isfahani 2014). Nevertheless, Iran's reform efforts demonstrate the importance of an effective subsidy reform package that complements pricing reform with complementary policy measures and a comprehensive communications strategy that cultivates a supportive political coalition.

Source: "Iran (Removal of Consumption Subsidies)," a case study prepared for this report.

With these elements in place, a communications strategy for subsidy reform will set the foundation for success. The communications strategy used during Iran's subsidy reform process, initiated in 2010, illustrates this in action (box 4.1).

4.4 When to Design a Subsidy Exit Strategy

An exit strategy is an important component of a subsidy reform package when the relevant subsidy is intended to be short term. When proposing a new

subsidy, policy makers should consider whether the conditions demanding the subsidy are permanent or likely to dissipate in the near future. Are all subsidy beneficiaries likely to be able to afford the full cost of service at some point in the future, and thus the subsidy can be removed, or will some degree of support need to continue, with potential modifications to the subsidy amount and targeting? If the conditions are temporary in nature, policy makers should develop a credible commitment mechanism that helps government exit when the time is right.

Where particular user groups enjoy entrenched benefits, social safety nets or time-bound cash transfers may be required when subsidies are either removed or reformed. The Iranian government, for example, made use of additional revenue gained from the removal of large, regressive energy and water subsidies to simultaneously introduce universal monthly cash transfers to households⁹ and financial assistance to private businesses. Given these groups' long-standing dependence on subsidized water and energy tariffs, providing such compensation proved necessary in the short to medium term to gain their support for reform (Demirkol et al. 2014).

To remove or modify entrenched subsidies, policy makers would do well to (i) mobilize political coalitions to support the intended reform, and (ii) sequence the elements of the reform package to mitigate potential resistance. Citizens' perceptions and expectations will shape their reaction to reform: Do they believe the status quo is economically inefficient? Do they believe they are benefiting from the subsidy (even if they are not)? Do they expect free water? Therefore, a communications strategy to discuss the evidence and develop a shared understanding of the need for change will be critical to mobilizing a political coalition in many contexts.¹⁰

A reform likely to adversely impact the poor or an otherwise politically salient group might be designed in such a way that subsidies are removed gradually, in phases, over time. As has been discussed, social safety nets may be used to ease households' burden as benefits are rolled back and/or eliminated. Some of the reform's phases might include additional elements such as complementary sector or legal reforms, policies to temporarily compensate users for the loss of benefits, and communication strategies, among others. The choice and timing of these elements should be politically informed.

Notes

1. Successful community management of WSS services, however, requires significant levels of external support, which may include linkages with professional area mechanics, supervision, and funding for recurrent costs (Chowns 2015).
2. See http://www.aysa.com.ar/index.php?id_seccion=569.
3. A range of design standards available for nonconventional sewerage may be appropriate in these contexts. For a discussion of them, see, for example, Ily et al. (2014).
4. Refer to section 2.2 for a description of the methodology undertaken. Low- and middle-income countries are defined by the International Monetary Fund as nonadvanced economies.
5. Note that our estimates of overall subsidies do include inefficiencies in billing and collections; however, we are unable to differentiate between subsidies associated with such inefficiencies and those associated with non-cost-recovery tariffs.
6. Capital costs amount to an average of 49 percent of total costs for water utilities in the United Kingdom (Kingdom et al. 2018).
7. This section is based on Inchauste, Victor, and Schiffer (2018: 11).
8. Note that not all interest groups will be politically organized. Moreover, within governments themselves, officials may hold conflicting positions regarding subsidy policy.
9. Note that, despite being universal, these cash transfers proved to be more progressive than the subsidies, through which low-income households benefited little. The government has since sought to gradually exclude wealthier households from the transfers.
10. Voters do not always understand the economic rationale behind change—even if they are going to benefit (e.g., through a cash transfer alongside subsidy removal).





CHAPTER 5

Key Takeaways

In this report, we explore the question of how scarce public resources can be used most effectively to achieve universal delivery of water supply and sanitation (WSS) services. We begin by analyzing existing subsidies in the sector before providing guidance to policy makers on how subsidies can be better designed and implemented to improve their efficacy and efficiency in attaining their objectives. **This report puts forward three key messages, as discussed below.**

Message 1: Current WSS subsidies fail to achieve their objectives due to poor design; they tend to be pervasive, expensive, poorly targeted, nontransparent, and distortionary. In chapter 2, we discuss each of these characteristics in detail:

- **Subsidies are pervasive across countries, irrespective of region or income level.** Subsidies are particularly prevalent among networked and sewerage WSS services, as illustrated by the IBNET database. Only 14 percent of the 1,549 listed utilities generate enough revenue to cover the total economic costs of service provision, while only 35 percent are able to cover, at a minimum, the operation and maintenance costs of service provision.
- **The cost of subsidies associated with the operations, maintenance, and replacement of existing WSS infrastructure in much of the world (excluding, notably, China and India) is an estimated \$289–\$353 billion per year, or 0.46–0.56 percent of these countries' combined gross domestic product.¹** This figure rises, shockingly, up to 1.59–1.95 percent if only low- and middle-income economies are considered, an amount largely due to the capital subsidies captured in our estimation. It is important to note that our estimation does not include either capital expenditure for infrastructure expansion—which tends to be fully subsidized—or environmental costs. Therefore, the actual global magnitude of networked water and sanitation subsidies is much greater than our estimation.
- **Most existing subsidies are poorly targeted to the poor.** In the 10 countries we analyzed, an average of 56 percent of networked water supply subsidies reach the wealthiest quintile of the population, while a mere 6 percent reach the poorest quintile.²

- **Many common approaches to subsidizing the WSS sector lack transparency;** this allows some service providers to misuse scarce public resources, failing to benefit customers through improved service quality and/or reduced costs.
- **Poorly designed subsidies contribute to inefficiency, and may even threaten the sustainability of service.** In addition, subsidized tariffs do not reflect the true cost of a service and therefore cannot provide signals that might encourage efficient production or consumption.

Message 2: The current poor performance of WSS subsidies can be avoided; new knowledge and technologies are making it increasingly possible for subsidies to cost less and help more.

- **Some amount of subsidy will always be needed, yet they should be well designed, transparent, and targeted.** Given that most of the remaining unserved are poor, subsidies will be essential for achieving the global goal of equitable access to safely managed WSS services for all. There is no one-size-fits-all solution to the problems of inadequate access to WSS services; all options have both strengths and weaknesses. The most suitable policy will depend on the specific goals to be attained, the resource constraints of the government and stakeholders, and the context in which it is to be implemented (i.e., the specific demographic, environmental, institutional, and cultural characteristics, as well as on baseline levels of access to WSS services across population groups). However, the scarcity of public resources and the inevitable presence of trade-offs demand that subsidies be well designed, transparent, and targeted.
- **New knowledge and technologies are providing policy makers with an increasing array of tools to improve subsidy performance.** For example,

increasing block tariffs have generally been employed to target subsidies to poor households since the latter are thought to use less water than do wealthier households. Yet there is growing evidence that such pricing is ineffective, as piped water consumption is not correlated with poverty (Fuente and Bartram 2018). As an alternative, there is an increasing array of targeting options made possible through technological innovations. Additionally, the inefficiencies arising from supply-side subsidies are not inevitable—subsidies can be made conditional on performance. Despite the pessimism surrounding the possibility of leveraging commercial financing in the WSS sector, the strategic use of subsidies can improve investors' perceived risk-reward balance, in turn attracting private resources. Finally, designing subsidies to advance equitable access to affordable WSS services can be facilitated through the use of a redefined metric of service affordability, proposed in this report, that more accurately estimates service costs, better assesses households' financial constraints, and provides information specific to a government's particular sectoral goals.

Message 3: To successfully reform subsidies, a subsidy reform package, in addition to improved subsidy design, is required. An effective subsidy reform package includes complementary policy measures, the building of a supportive political coalition, a communications strategy, and an exit strategy (where applicable).

- **Various complementary policy mechanisms may be used to complement subsidies, with the aim of improving WSS services' access and affordability for the poorest segments of the population.** A number of mechanisms can be used to reduce the amount of subsidy required or to support service providers in more effectively targeting subsidies to the poor

and in overcoming financial, legal, or administrative barriers to access.

- **To design feasible reforms and implementation plans, it is crucial to develop a strategy to both foster supportive political coalitions and mitigate the impact of opponents.** Policy makers must understand the interplay between various sector stakeholders and tailor policies that mobilize a political coalition in favor of reform or, at the least, tacitly supportive of it.
- **A well-planned, consistent, and flexible communications strategy will help galvanize such public support.** By assessing risks and opportunities early, informing the public in accessible and engaging ways, and helping people understand the benefits of subsidy reform and how these link to their own lives, policy makers can encourage public understanding—and, ultimately, goodwill.
- **Finally, policy makers should consider whether the conditions giving rise to subsidies are persistent or likely to dissipate in the near future.** If the conditions are temporary, policy makers should plan ahead for the phased reduction or removal of subsidies.

The SDGs for water supply and sanitation set out a transformational vision for the future whose

achievement will require substantial financial resources. Given the scarcity of public resources globally, it is more important than ever to ensure that those public resources already allocated to the sector are used efficiently. Well-designed subsidies effectively achieve the goals of expanding access to affordable, sustainable, and quality WSS services, while maximizing the targeting of the poor, promoting transparency, and minimizing distortion. As the financial sustainability of service providers improves, these public resources can be leveraged to attract complementary private resources to the sector. By moving beyond the design flaws of the past, subsidies are a viable means of ensuring access to sustainable and safely managed water supply and sanitation services for all.

Notes

1. China and India were notably excluded due to insufficient data and the fact that their singularity makes estimates based on extrapolation impossible.
2. Building on the methods of Komives et al. (2005) and Angel-Urdinola and Wodon (2011), we provide new estimates of the performance of piped-water consumption subsidies in terms of pro-poor targeting across 10 countries: Ethiopia, Mali, Niger, Nigeria, Uganda, El Salvador, Jamaica, Panama, Bangladesh, and Vietnam.





References

Please refer to appendix A for a list of background papers and case studies prepared as part of the present study.

1001 Fontaines. n.d. “The Approach.” <https://www.1001fontaines.com/en/approach>.

Alsan, M., and C. Goldin. 2019. “Watersheds in Child Mortality: The Role of Effective Water and Sewerage Infrastructure, 1880–1920.” *Journal of Political Economy* 127 (2): 586–38.

Andres, L., D. Biller, and M. H. Dappe. 2013. *Reducing Poverty by Closing South Asia’s Infrastructure Gap (English)*. Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/881321468170977482/Reducing-poverty-by-closing-South-Asias-infrastructure-gap>.

Andres, L., S. Deb, M. Gambrill, E. Giannone, G. Joseph, P. Kannath, M. Kumar, P. K. Kurian, R. Many, and A. Muwonge. 2017. “Sustainability of Demand Responsive Approaches to Rural Water Supply: The Case of Kerala.” Policy Research Working Paper 8025, World Bank, Washington, DC.

Andres, L., C. Chase, Y. Chen, R. Damania, G. Joseph, R. Namara, J. Russ, and E. D. Zaveri. 2018. “Water and Human Capital: Impacts across the Lifecycle.” World Bank, Washington, DC.

Andres, L., C. Brocklehurst, J. Grabinsky, G. Joseph, and M. Thibert. Forthcoming. “Measuring the Affordability of Water Supply, Sanitation, and Hygiene Services: New Framework and Evidence.”

Angel-Urdinola, D., and Q. Wodon. 2011. “Does Increasing Access to Infrastructure Services Improve the Targeting Performance of Water Subsidies?” *Journal of International Development* 24 (1): 88–101. <http://microdata.worldbank.org/index.php/citations/2168>.

AWWA (American Water Works Association). 2015. “Disinfecting Water Mains.” AWWA Standard, ANSI/AWWA C651-14, AWWA, New York. https://www.mwa.co.th/download/prd01/reference/AWWA_std/Disinfecting_Water_Mains.pdf.

Banerjee, S., V. Foster, Y. Ying, H. Skilling, and Q. Wodon. 2010. “Cost Recovery, Equity and Efficiency in Water Tariffs: Evidence from African Utilities.” Policy Research Working Paper 5384, World Bank, Washington, DC.

Barde, J. A., and P. Lehmann. 2014. “Distributional Effects of Water Tariff Reforms—An Empirical Study for Lima, Peru.” *Water Resources and Economics* 6: 30–57.

Beato, P. 2000. “Cross Subsidies in Public Services: Some Issues.” Technical Papers Series, Sustainable Development Department, Inter-American Development Bank (IDB).

Boistard, P. 1993. “Influence of the Price of Public Water Utilities on Domestic Water Consumption.” *Revue des sciences de l’eau (Journal of Water Science)* 6 (3): 335–52.

Broadway, R., and A. Shah. 2007. *Intergovernmental Fiscal Transfers: Principles and Practice*. Washington, DC: World Bank.

Brocklehurst, C. 2001. *Durban Metro Water: Private Sector Partnerships to Serve the Poor*. Nairobi, Kenya: Water and Sanitation Program.

- Carver, P. H., and J. J. Boland. 1980. "Short-and Long-Run Effects of Price on Municipal Water Use." *Water Resources Research* 16 (4): 609-16.
- Castaneda, A., D. Doan, D. Newhouse, M. C. Nguyen, H. Uematsu, and J. P. Azevedo. 2016. "Who Are the Poor in the Developing World?" Policy Research Working Paper 7844, World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/25161>.
- Chown, E. 2015. "Is Community Management an Efficient and Effective Model of Public Service Delivery? Lessons from the Rural Water Supply Sector in Malawi." *Public Administration and Development* 35 (4): 263-76. doi: 10.1002/pad.1737.
- Chen, G. 2018. "Plugging the Leaks to Help Close the Water Financing and Access Gaps." *Everything About Water E-Magazine* (February 2018): 16-17.
- Clasen, T. F., K. T. Alexander, D. Sinclair, S. Boisson, R. Peletz, H. H. Chang, F. Majorin, and S. Cairncross. 2015. "Interventions to Improve Water Quality for Preventing Diarrhoea." *Cochrane Database of Systematic Reviews* 10: 1-201.
- Contreras, D., A. Gomez-Lobo, and I. Palma. 2018. "Revisiting the Distributional Impacts of Water Subsidy Policy in Chile: A Historical Analysis from 1998-2015." *Water Policy* 20 (6): 1208-26. <https://doi.org/10.2166/wp.2018.073>.
- Cronin, A. A., M. E. Gnito, M. Odagiri, and S. Wijesekera. 2017. "Equity Implications for Sanitation from Recent Health and Nutrition Evidence." *International Journal for Equity in Health* 16 (1): 211.
- Demirkol, O., R. Blotvogel, R. Zytke, P. Zimand, and Y. Liu. 2014. "Targeted Subsidy Reform in Iran." IMF Selected Issues Paper on Islamic Republic of Iran, International Monetary Fund, Washington, DC, March 18.
- de Waal, D., M. Duret, A. Gaju, M. Hirn, S. Huston, N. Jain, D. Mirindi, N. Mudege, D. Niyungeko, C. Richey, C. Ochieng, C. Print, M. Sitali, and H. Skilling. 2017. *Water Supply: The Transition from Emergency to Development Support*. Nairobi, Kenya: World Bank.
- Dickinson, K., S. Patil, S. Pattanayak, C. Poulos, and J.-H. Yang. 2015. "Nature's Call: Impacts of Sanitation Choices in Orissa, India." *Economic Development and Cultural Change* 64 (1): 1-29.
- Eales, K., and D. Schaub-Jones. 2005. "Sanitation Partnerships: Landlord or Tenant? The Importance of Rental Relationships to Poor Community Sanitation in 3 African Countries." BPD Sanitation Series, Building Partnerships for Development in Water and Sanitation, London. <https://nl.ircwash.org/sites/default/files/Schaub-Jones-Eales-2008-Sanitation.pdf>.
- ECLAC (Economic Commission of Latin America and the Caribbean). 2016. "Registro Unico de Programas Sociales del Gobierno Federal de Brasil." <https://dds.cepal.org/eventos/presentaciones/2016/0418/Panel-II.1.Brasil-FRibeiro.pdf>.
- Faulhaber, G. R. 1975. "Cross-Subsidization: Pricing in Public Enterprises." *The American Economic Review* 65 (5): 966-77.
- Fay, M., H. Hyoung, M. Mastruzzi, S. Han, and M. Cho. 2019. "Hitting the Trillion Mark: A Look at How Much Countries Are Spending on Infrastructure." Policy Research Working Paper WPS 8730, World Bank Group, Washington, DC. <https://hubs.worldbank.org/docs/ImageBank/Pages/DocProfile.aspx?nodeid=30803488>.
- Fay, M., L. A. Andres, C. J. E. Fox, U. G. Narloch, S. Straub, and M. A. Slawson. 2017. *Rethinking Infrastructure in Latin America and the Caribbean: Spending Better to Achieve More (English)*. Directions in Development. Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/348971500544504305/Rethinking-infrastructure-in-Latin-America-and-the-Caribbean-spending-better-to-achieve-more>.
- Fonseca, C., and L. Pories. 2017. "Financing WASH: How to Increase Funds for the Sector while Reducing Inequities." Position paper for the Sanitation and Water for All Finance Ministers Meeting, April 19. https://sswm.info/sites/default/files/reference_attachments/Fonseca%3B%20Pories%20%282017%29%20Financing%20WASH.pdf.
- Foster, T., S. Furey, B. Banks, and J. Willets. 2019. "Functionality of Handpump Water Supplies: A Review of Data from Sub-Saharan Africa and the Asia-Pacific Region." *International Journal of Water Resources Development*. DOI: 10.1080/07900627.2018.1543117.
- Foster, V., and C. Briceno-Garmendia. 2010. *Africa's Infrastructure: A Time for Transformation: A Time for Transformation*. Africa Development Forum. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/2692>.
- Foster, V., A. Gómez-Lobos, and J. Halpern. 2000. "Designing Direct Subsidies for the Poor: A Water and Sanitation Case Study." Viewpoint, Note no. 211, World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/11428>.
- Fuente, D., and J. Bartram. 2018. "Pro-Poor Governance in Water and Sanitation Service Delivery: Evidence from Global Analysis and Assessment of Sanitation and Drinking Water Surveys." *Perspectives in Public Health* 138 (5): 261-69. <https://doi.org/10.1177/1757913918788109>.
- Fuente, D., J. Gakii Gatua, M. Ikiara, J. Kabubo-Mariara, M. Mwaura, and D. Whittington. 2016. "Water and Sanitation Service Delivery, Pricing, and the Poor: An Empirical Estimate of Subsidy Incidence in Nairobi, Kenya." *Water Resources Research* 52 (6): 4845-62. doi:10.1002/2015WR018375.
- Gallaher, M., T. Alam, and N. Rouchdy. 2017. "The Impact of Electricity and Water Subsidies in the United Arab Emirates." RTI Policy Brief no. PB-0012-1705, RTI Press, Research Triangle Park, NC.
- Gamper-Rabindran, S., S. Khan, and C. Timmins. 2010. "The Impact of Piped Water Provision on Infant Mortality in Brazil: A Quantile Panel Data Approach." *Journal of Development Economics* 92 (2): 188-200.
- Gertler, P., M. Shah, M. L. Alzua, L. Cameron, S. Martinez, and S. Patil. 2015. "How Does Health Promotion Work? Evidence from the Dirty Business of Eliminating Open Defecation." NBER Working Paper 20997, National Bureau of Economic Research, Cambridge, MA.
- Goksu, A., S. Trémolet, J. Kolker, and B. Kingdom. 2017. *Easing the Transition to Commercial Finance for Sustainable Water and Sanitation*. Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/182521503466225465/pdf/119048-WP-REPLACEMENT-PUBLIC.pdf>.

- Grafton, R. Q., M. B. Ward, H. To, and T. Kompas. 2011. "Determinants of Residential Water Consumption: Evidence and Analysis from a 10-Country Household Survey." *Water Resources Research* 47 (8).
- GRDR and GRET. 2016. *Améliorer l'Accès À l'Eau et À l'Assainissement en Mauritanie. Pour Une Plus Grande Implication Des Communes Dans Les Services D'eau Et D'assainissement*. Paris, France: GRDR and GRET. https://www.gret.org/wp-content/uploads/Guide-Aicha_Peagg_Vf2.pdf.
- Guillaume, D., R. Zyteck, and M. Reza Farzin. 2011. "Iran: The Chronicles of the Subsidy Reform." IMF Working Paper WP/11/167, International Monetary Fund, Washington, DC.
- Guiteras, R., J. Levinsohn, and A. M. Mobarak. 2015. "Encouraging Sanitation Investment in the Developing World: A Cluster-Randomized Trial." *Science* 348 (6237): 903-06.
- Gupta, A., D. Spears, D. Coffey, N. Srivastav, P. Hathi, and S. Vyas. 2017. "Understanding Open Defecation in Rural India: Untouchability, Pollution, and Latrine Pits." *RICE*, January 7. <https://riceinstitute.org/research/culture-and-the-health-transition-understanding-sanitation-behavior-in-rural-north-india/>.
- GW (Global Water Intelligence). 2004. "Tariffs: Half Way There." GWI, Oxford, United Kingdom.
- Hanke, S. H., and L. D. Mare. 1982. "Residential Water Demand: A Pooled, Time Series, Cross Section Study of Malmö, Sweden." *JAWRA (Journal of the American Water Resources Association)* 18 (4): 621-26.
- Hansen, L. G. 1996. "Water and Energy Price Impacts on Residential Water Demand in Copenhagen." *Land Economics* 72 (1): 66-79.
- Harberger, A. 1971. "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay." *Journal of Economic Literature* 9 (3): 785-97.
- Hathi, P., S. Haque, L. Pant, D. Coffey, and D. Spears. 2017. "Place and Child Health: The Interaction of Population Density and Sanitation in Developing Countries." *Demography* 54 (1): 337-60. <https://doi.org/10.1007/s13524-016-0538-y>.
- Heymans, C., K. Eales, and R. Franceys. 2014. *The Limits and Possibilities of Prepaid Water in Urban Africa: Lessons from the Field*. Washington, DC: World Bank. <https://www.wsp.org/sites/wsp.org/files/publications/WSP-Prepaid-Water-Africa.pdf>.
- Heymans, C., R. Eberhard, D. Ehrhardt, and S. Riley. 2016. *Providing Water to Poor People in African Cities : Lessons from Utility Reforms (English)*. Water and Sanitation Program Report, Water and Sanitation Program (WSP). Washington, DC : World Bank Group. <http://documents.worldbank.org/curated/en/316751472482999236/Providing-water-to-poor-people-in-african-cities-lessons-from-utility-reforms>.
- Hope, R. A., T. Foster, A. Krolkowski, and I. Cohen. 2011. "Mobile Water Payment Innovations in Urban Africa." School of Geography and the Environment and Skoll Centre for Social Entrepreneurship at Saïd Business School, Oxford University, UK.
- Hutton, G., and M. Varughese. 2016. "The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene." Water and Sanitation Program Technical Paper 103171, World Bank, Washington, DC.
- Ily, J.-M., C. Le Jallé, J. Gabert, and G. D. Desille. 2014. *Non-Conventional Sewerage Services: When to Choose This Option, How to Implement This Solution*. Paris: Programme Solidarité-Eau.
- Inchauste, G., D. G. Victor, and E. Schiffer. 2018. *Good Practice Note 9: Assessing the Political Economy of Energy Subsidies to Support Policy Reform Operations*. Energy Subsidy Reform Assessment Framework (ESRAF). Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/976071531112775611/pdf/ESRAF-note-9-Assessing-the-Political-Economy-of-Energy-Subsidies-to-Support-Policy-Reform-Operations.pdf>.
- Institute of Development Studies. n.d. "Countries." *Community-Led Total Sanitation*. Accessed June 10, 2019. <http://www.communityledtotalsanitation.org/where>.
- Ito, K. 2013. *How Do Consumers Respond to Nonlinear Pricing? Evidence from Household Water Demand*. University of Chicago. http://home.uchicago.edu/ito/pdf/Ito_Water_Irvine.pdf.
- . 2014. "Do Consumers Respond to Marginal or Average Price? Evidence from Nonlinear Electricity Pricing." *American Economic Review* 104 (2): 537-63.
- Joskow, P. 2005. "Regulation of Natural Monopolies." MIT-CEEPR Working Paper 05-008 WP, Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology, Cambridge, MA, April.
- Kar, K., and R. Chambers. 2008. *Handbook on Community-Led Total Sanitation*. Brighton, UK: Institute of Development Studies.
- Katzman, M. T. 1977. "Income and Price Elasticities of Demand for Water in Developing Countries." *JAWRA (Journal of the American Water Resources Association)* 13 (1): 47-55.
- Khandker, S., B. Khalily, and Z. Khan. 1995. *Grameen Bank: Performance and Sustainability*. Washington, DC: World Bank.
- Kingdom, B., D. Lloyd-Owen, S. Trémolet, S. Kayaga, and J. Ikeda. 2018. "Better Use of Capital to Deliver Sustainable Water Supply and Sanitation Services: Practical Examples and Suggested Next Steps." World Bank, Washington, DC.
- Kochhar, M. K., M. C. A. Pattillo, M. Y. Sun, M. N. Suphaphiphat, A. Swiston, M. R. Tchaidze, B. J. Clements, S. Fabrizio, V. Flamini, L. Redifer, and M. H. Finger. 2015. "Is the Glass Half Empty or Half Full? Issues in Managing Water Challenges and Policy Instruments." IMF Staff Discussion Note SDN/15/11, International Monetary Fund, Washington, DC.
- Komives, K., V. Foster, J. Halpern, Q. Wodon, and R. Abdullah. 2005. *Water, Electricity, and the Poor: Who Benefits from Utility Subsidies? (English)*. Directions in Development. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/606521468136796984/Water-electricity-and-the-poor-who-benefits-from-utility-subsidies>.
- Kulinkina, A. V., J. D. Plummer, K. Chui, K. C. Kosinski, T. Adomako-Adjei, A. I. Egorov, and E. N. Naumova. 2017. "Physicochemical Parameters Affecting the Perception of Borehole Water Quality in Ghana." *International Journal of Hygiene and Environmental Health* 220 (6): 990-97. doi:10.1016/j.ijheh.2017.05.008.

- Laffont, J.-J., and J. Tirole. 1993. *A Theory of Incentives in Regulation and Procurement*. Cambridge, MA: MIT Press.
- Lauria, D., and O. Hopkins. 2004. *Pro-Poor Subsidies for Water Connections: Cases from West Africa*. Consultant's Report. Chapel Hill: University of North Carolina.
- Lauria, D. T., O. S. Hopkins, and S. Debomy. 2005. *Pro-Poor Subsidies for Water Connections in West Africa: A Preliminary Study*. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/502151468319557784/A-preliminary-study>.
- Le Blanc, D. 2008. "A Framework for Analyzing Tariffs and Subsidies in Water Provision to Urban Households in Developing Countries." DESA Working Paper 63, United Nations Department of Economic and Social Affairs, New York.
- Lipsey, R. G., and K. Lancaster. 1956. "The General Theory of Second Best." *Review of Economic Studies* 24 (1): 11-32. doi:10.2307/2296233. JSTOR 2296233.
- Mason, N., D. Harris, and R. Batley. 2013. *The Technical Is Political: Understanding the Political Implications of Sector Characteristics for the Delivery of Drinking Water Services*. London: Overseas Development Institute. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8640.pdf>.
- McCarthy, Shawn. 2019. "Federal Budget 2019: Ottawa Pledges \$4.7-Billion in Funds to Address Indigenous Issues." *The Globe and Mail*, March 19. <https://www.theglobeandmail.com/politics/article-grits-pledge-47-billion-in-funds-to-address-indigenous-issues/>.
- McLoughlin, C., and R. Batley. 2012. "The Effects of Sector Characteristics on Accountability Relationships in Service Delivery." Working Paper 350, Overseas Development Institute, London.
- Meeks, R. 2018. "Property Rights and Water Access: Evidence from Land Titling in Rural Peru." *World Development* 102 (C): 345-57.
- Mumssen, Y., G. Saltiel, and B. Kingdom. 2018. "Aligning Institutions and Incentives for Sustainable Water Supply and Sanitation Services. Report of the Water Supply and Sanitation Global Solutions Group." World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/271871525756383450/pdf/126016-WP-P159124-PUBLIC-7-5-2018-12-14-46-W.pdf>.
- Nagpal, T., A. Malik, M. Eldridge, Y. Kim, and C. Hauenstein. 2018. *Mobilizing Additional Funds for Pro-Poor Water Services: An Exploration of Potential Models to Finance Safe Water Access in Support of Sustainable Development Goal 6.1*. Washington, DC: Urban Institute.
- Nauges, C., and D. Whittington. 2017. "Evaluating the Performance of Alternative Municipal Tariff Designs: Quantifying the Tradeoffs between Equity, Economic Efficiency, and Cost Recovery." *World Development* 91: 125-43.
- Nicholson, W., and C. M. Snyder. 2008. *Microeconomic Theory: Basic Principles and Extensions*. United States: Thomson/South-Western. https://books.google.com/books/about/Microeconomic_theory.html?id=6-jfAAAAAAAJ.
- OECD (Organisation for Economic Co-operation and Development). 2009. *Managing Water for All: An OECD Perspective on Pricing and Financing—Key Messages for Policy Makers*. Paris: OECD Publishing. <https://doi.org/10.1787/9789264060548-en>.
- . 2018. *Making Blended Finance Work for the Sustainable Development Goals*. Paris: OECD Publishing.
- OVE (Office of Evaluation and Oversight). 2016. "Fortalecimiento de las Juntas de Saneamiento. Organicemos Nuestra junta de Saneamiento." <http://www.senasa.gov.py/application/files/3714/6066/9525/Manual-1-Organicemos-nuestra-junta-de-Saneamiento1.pdf>.
- Patil, S., B. Arnold, A. Salvatore, B. Briceño, S. Ganguly, J. Colford, and P. 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 Medicine* 11 (8): e1001709. <https://doi.org/10.1371/journal.pmed>.
- Pattanayak, S., J.-C. Yang, K. Dickinson, C. Poulos, S. Patil, R. Mallick, J. Blitstein, and P. Praharaj. 2009. "Shame or Subsidy Revisited: Social Mobilization for Sanitation in Orissa, India." *Bulletin of the World Health Organization* 87 (8): 580-87.
- Prüss-Üstün A., R. Bos, F. Gore, and J. Bartram. 2008. *Safer Water, Better Health: Costs, Benefits and Sustainability of Interventions to Protect and Promote Health*. Geneva: World Health Organization.
- Prüss-Üstün, A., J. Bartram, T. Clasen, J. M. Colford Jr., O. Cumming, V. Curtis, S. Bonjour, A. D. Dangour, J. De France, L. Fewtrell, and M. C. Freeman. 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 & International Health* 19 (8): 894-905.
- Ravallion, M., S. Chen, and P. Sangraula. 2010. "New Evidence on the Urbanization of Global Poverty." Policy Research Working Paper WPS 4199, Development Research Group, World Bank, Washington, DC.
- Rivera, Jr., V. 2014. *Tap Secrets: The Manila Water Story*. Mandaluyong City, Philippines: Asian Development Bank and Manila Water Company. <https://www.adb.org/publications/tap-secrets-manila-water-story>.
- Rodriguez, D. J., M. A. Suardi, M. Ham, L. M. Mimmi, and A. J. Goksu. 2014. "Applying Results-Based Financing in Water Investments." Water papers, Water Partnership Program (WPP), World Bank Group, Washington, DC.
- Sadoff, C. W., E. Borgomeo, and D. de Waal. 2017. *Turbulent Waters Pursuing Water Security in Fragile Contexts*. Water Global Practice. Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/885171489432062054/pdf/113504-WP-P15770-PUBLIC-3-14-8am-W16005-eBook.pdf>.
- Salehi-Isfahani, D. 2014. "Iran's Subsidy Reform: From Promise to Disappointment." Policy Perspective No. 13, Economic Research Forum (ERF), Dokki, Egypt. http://erf.org.eg/wp-content/uploads/2015/12/PP13_2014.pdf.
- Savedoff, W. D., and P. T. Spiller. 1999. *Spilled Water: Institutional Commitment in the Provision of Water Services*. Washington, DC: Inter-American Development Bank (IDB).

- Serra, P. 2000. "Subsidies in Chilean Public Utilities." Policy Research Working Paper WPS 2445, World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/850051468768861504/pdf/multi-page.pdf>.
- Smets, H. 2012. "Quantifying the Affordability Standard." In *The Human Right to Water: Theory, Practice and Prospects*, edited by Malcolm Langford, 225-75. Cambridge: Cambridge University Press.
- Soppe, G. N. A., N. M. Janson, and S. Piantini. 2018. "Water Utility Turnaround Framework: A Guide for Improving Performance." World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/515931542315166330/Water-Utility-Turnaround-Framework-A-Guide-for-Improving-Performance>.
- Stites, E., K. Howe, and D. Akabwai. 2017. *Five Years On: Livelihood Advances, Innovations, and Continuing Challenges in Karamoja Uganda*. Somerville, MA: Feinstein International Center, Tufts University.
- Sulabh International Social Service Organisation. 2016. "Water that Heals." News release, February 21. <http://www.sulabhinternational.org/water-that-heals/>.
- . 2018. "Bihar To Make Contaminated Water Potable." News release, July 16. <http://www.sulabhinternational.org/bihar-to-make-contaminated-water-potable/>.
- Trémolet, S., P. Kolsky, and E. Perez. 2010. "Financing On-Site Sanitation for the Poor: A Six Country Comparative Review and Analysis." Technical Paper, Water and Sanitation Program, January 2010.
- Tynan, N., and B. Kingdom. 2005. "Optimal Size for Utilities>Returns to Scale in Water: Evidence from Benchmarking." Viewpoint, Note no. 283, World Bank, Washington, DC.
- USAID (United States Agency for International Development). 2018a. *An Examination of CLTS's Contributions toward Universal Sanitation*. Washington, DC: USAID Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability (WASHPaLS).
- . 2018b. *Scaling Market Based Sanitation: Desk Review on Market-Based Rural Sanitation Development Programs*. Washington, DC: USAID Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability (WASHPaLS).
- Van Bueren, M., and D. H. MacDonald. 2004. "Addressing Water-Related Externalities: Issues for Consideration." Paper presented at Water Policy Workshop convened by the Australian Agricultural and Resource Economics Society, Melbourne, February 10.
- Walker, I., F. Ordonez, P. Serrano, and J. Halpern. 2000. "Pricing, Subsidies, and the Poor: Demand for Improved Water Services in Central America." Policy Research Working Paper 2468, World Bank, Washington, DC.
- Water.org. 2018. *Programmatic Impact Update: Second Quarter Report*. January 2018-March 2018, World Water Development Report, Chapter 4.
- Whittington, D., C. Nauges, D. Fuente, and X. Wu. 2015. "A Diagnostic Tool for Estimating the Incidence of Subsidies Delivered by Water Utilities in Low- and Medium-Income Countries, with Illustrative Simulations." *Utilities Policy* 34: 70-81.
- WHO (World Health Organization). 2012a. *Global Costs and Benefits of Drinking-Water Supply and Sanitation Interventions to Reach the MDG Target and Universal Coverage*. Geneva: WHO.
- . 2012b. UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2012 report: *The Challenge of Extending and Sustaining Service*. Geneva: WHO. <http://www.who.int/iris/handle/10665/44849>.
- . 2017. UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2017 report: *Financing Universal Water, Sanitation and Hygiene under the Sustainable Development Goals*. Geneva: WHO. License: CC BY-NC-SA 3.0 IGO.
- . 2018. *Guidelines on Sanitation and Health*. Geneva: WHO.
- WHO and UNICEF (United Nations Children's Fund). 2017. *Progress on Drinking Water, Sanitation and Hygiene*. Geneva: WHO and UNICEF.
- Wolf, J., P. R. Hunter, M. C. Freeman, O. Cumming, T. Clasen, J. Bartram, J. P. Higgins, R. Johnston, K. Medlicott, S. Boisson, and A. Prüss-Ustün. 2018. "Impact of Drinking Water, Sanitation and Handwashing with Soap on Childhood Diarrhoeal Disease: Updated Meta-Analysis and Meta-Regression." *Tropical Medicine & International Health* 23 (5): 508-25.
- World Bank Group. 2002. *Willingness to Charge and Willingness to Pay: The World Bank-Assisted China Rural Water Supply and Sanitation Program*. Washington, DC: World Bank.
- . 2003. *World Development Report 2004 : Making Services Work for Poor People*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/5986>.
- . 2017a. *A Thirst for Change: The World Bank Group's Support for Water Supply and Sanitation, with Focus on the Poor*. Independent Evaluation Group. Washington, DC: World Bank Group.
- . 2017b. *Reducing Inequalities in Water Supply, Sanitation, and Hygiene in the Era of the Sustainable Development Goals: Synthesis Report of the WASH Poverty Diagnostic Initiative*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/27831>.
- . 2017c. *A Wake Up Call: Nigeria Water Supply, Sanitation, and Hygiene Poverty Diagnostic*. WASH Poverty Diagnostic. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/27703>.
- . 2018a. *Water's Edge: Rising to the Challenge of a Changing World*. Global Water Security & Sanitation Partnership Annual Report 2018. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/501621542313008673/pdf/132114-AR-PUBLIC-nov-26-5am-GWSPAR-Web.pdf>.
- . 2018b. *When Water Becomes a Hazard: A Diagnostic Report on the State of Water Supply, Sanitation and Poverty in Pakistan and Its Impact on Child Stunting: Pakistan*. Washington, DC: World Bank Group. <http://documents.worldbank.org/curated/en/649341541535842288/pdf/131860-WP-P150794-PakistanWASHPovertyDiagnostic.pdf>.
- . 2018c. *Getting the Price Right: A Review of Water Tariffs*. Washington, DC: World Bank. (Unpublished manuscript).

—. 2018e. “Regulation of Water Supply and Sanitation in Bank Client Countries: A Fresh Look.” Discussion Paper of the Water Supply and Sanitation Global Solutions Group, Water Global Practice, World Bank, Washington, DC. <https://openknowledge.worldbank.org/bitstream/handle/10986/30869/132262-WP-P159124-PUBLIC-20-11-2018-13-50-14-W.pdf?sequence=1&isAllowed=y>.

—. 2019. “Angola Water, Sanitation, and Hygiene (WASH) Sector Diagnostic.” Project concept note P169877. Water Global Practice, World Bank, Washington, DC.

WSUP (Water and Sanitation for the Urban Poor). 2013. “Dealing with Land Tenure and Tenancy Challenges in Water and Sanitation Services

Delivery.” Topic brief TB#006, USAID, Washington, DC. <https://www.wsup.com/content/uploads/2017/08/TB006-ENGLISH-Tenure-Tenancy.pdf>.

WUP (Water Utility Partnership for Capacity Building) Africa. 2003. *Better Water and Sanitation for the Urban Poor: Good Practice from Sub-Saharan Africa*. Kenya: European Communities and Water Utility Partnership, World Bank.

WWAP (UNESCO World Water Assessment Programme). 2019. *The United Nations World Water Development Report 2019: Leaving No One Behind*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).





APPENDIX A

Related Background Papers and Case Studies

Unpublished Background Papers Prepared for the Present Study

“Description of Subsidies.” Background Paper 1, World Bank, Washington, DC.

“Estimating the Magnitude of Subsidies.” Background Paper 2, World Bank, Washington, DC.

“Identification of Capital Expenditures and Subsidies in the Water and Sanitation Sector Using BOOST Data.” Background Paper 3, World Bank, Washington, DC.

“Costs Estimation in the Water and Sanitation Sector.” Background Paper 4, World Bank, Washington, DC.

“Quasi-Fiscal Deficits in WSS: The Effect of Hidden Costs on Performance.” Background Paper 5, World Bank, Washington, DC.

“On the Use and Misuse of Prices and Subsidies in the Water Sector.” Background Paper 6, World Bank, Washington, DC.

“The Distributional Performance of Piped Water Consumption Subsidies.” Background Paper 7, World Bank, Washington, DC.

“Access Subsidies.” Background Paper 8, World Bank, Washington, DC.

“Targeted Consumption Subsidies Reconsidered.” Background Paper 9, World Bank, Washington, DC.

“CAPEX Reconsidered.” Background Paper 10, World Bank, Washington, DC.

“Subsidies of Non-Networked WASH Services.” Background Paper 11, World Bank, Washington, DC.

“Affordability of WASH: Issues, Approaches and Measurement (with Data Analysis from Nigeria).” Background Paper 12, World Bank, Washington, DC.

“Community-Led Total Sanitation: A Global Evaluation.” Background Paper 13, World Bank, Washington, DC.

“Deciding the Best Use of Scarce Public Funds.” Background Paper 14, World Bank, Washington, DC.

“The Impact of Subsidies on Leveraging Private Financing in the Water Supply and Sanitation Sector.” Background Paper 15, World Bank, Washington, DC.

“Alternative Mechanisms for Reaching the Poor.” Background Paper 16, World Bank, Washington, DC.

“Output-Based Aid in the Water Sector: An Overview.” Background Paper 17, World Bank, Washington, DC.

“The Political Economy of Water and Sanitation Subsidies.” Background Paper 18, World Bank, Washington, DC.

“Communications Strategy.” Background Paper 19, World Bank, Washington, DC.

“WSS Subsidization in Countries Affected by Fragility, Conflict and Violence.” Background Paper 20, World Bank, Washington, DC.

Unpublished Case Studies on Subsidy Reform Prepared for the Present Study

“Argentina (Means-Tested Targeting).” World Bank, Washington, DC.

“Chile (Means-Tested Targeting).” World Bank, Washington, DC.

“Colombia (Geographical And Means-Tested Targeting).” World Bank, Washington, DC.

“Iran (Removal of Consumption Subsidies).” World Bank, Washington, DC.

“Kenya (OBA and Water ATMs).” World Bank, Washington, DC.

“Mexico (Implicit Subsidy Schemes—The ‘Aprovechamiento’ System).” World Bank, Washington, DC.

“Mexico (Incidence of Subsidies to Residential Public Services).” World Bank, Washington, DC.

“Mexico (Means-Tested CCTs).” World Bank, Washington, DC.

“Peru (Means-Tested and Geographic Targeting).” World Bank, Washington, DC.

“Uganda (Public Stand Pipes).” World Bank, Washington, DC.





APPENDIX B

Methodology for Estimating the Magnitude of Networked Water and Sanitation Subsidies

To estimate subsidy levels at the international level, we used utility-specific data from the World Bank's International Benchmarking Network for Water and Sanitation Utilities (IBNET) complemented with estimates of the long-term incremental costs of efficient model utilities, as determined by the Chilean regulator, with the aim of computing an efficient water supply and sanitation tariff for each utility covered by IBNET.¹ This method is indeed appropriate for our purposes, as it not only aims to maximize both allocative efficiency as well as productive efficiency but also allows each utility to generate enough revenue to cover the costs incurred in providing service. Regarding allocative efficiency, the approach attempts to recreate competitive market results: efficient quantities are produced by charging tariffs equal to the marginal costs a utility faces. Moreover, productive efficiency is achieved (or is at the very least aimed at) by producing efficient quantities at the lowest cost possible, considering feasible parameters.

It is assumed that any additional inefficiencies a utility might have are not passed on to consumers through pricing, effectively encouraging utilities to be as efficient as possible. In Chile, assets are estimated using a greenfield scenario at the start of every five-year period. To this end, the regulator models each utility based upon its size, network characteristics, services provided, and the subactivities conducted for each service (e.g., production, treatment, and distribution), taking into account any necessary expansion stemming from demand growth. Efficient, optimized asset values for each service provided (water and/or sanitation) are obtained from calculating the net present value of future investments in the j subactivities related to that service:

$$K^l = \frac{\sum_{i,j} \text{Investments}_i^{j,l}}{(1+r)^i}$$

Where:

- K : Efficient optimized asset base values for each service l
- $Investments_j^i$: Investments in the j subactivities (production, treatment, distribution) in period i
- r : Opportunity cost of capital

Information on the efficient asset base for each utility was obtained from its latest available tariff review. We converted this value to U.S. dollars and applied an inflation factor, to express all values in 2017 U.S. dollars. To estimate the capital investment for other utilities we need to identify a common driver.

In general, the main determinant of the total capital devoted to providing each service is the size of the customer base. So, estimating capital expenditure (CAPEX) per capita per service may be used as the basis of computing total capital costs for other utilities.

Chile's mechanism for determining tariffs is based on a greenfield project with a 35-year² time horizon. Therefore, the asset base computed is a function of demand growth over 35 years. Chile's regulator estimates the annuity of investments and associated customers over that time period, allowing us to construct a unit capital cost indicator that will properly account for demand growth. Formally:

$$Unit\ K^l \left(\frac{USD}{Customers} \right) = \frac{Annuity \left(Investments^l \right)}{Annuity \left(Customers^l \right)}$$

Where:

- $Investments^l$: Investments in each service l
- $Customers^l$: Customers in each service l
- $Unit\ K^l$: Unit capital costs in dollars for each service l

According to the size of their customer base, it is possible to categorize the 15 Chilean model utilities into three groups (large, medium, and small), as shown in

table B.1. The values are weighted averages of the unit asset base for each category, disaggregated by service.

The appropriate unit cost is then applied to the IBNET customer field to obtain an optimized asset value for each service (water and/or sanitation) provided by each utility represented in the IBNET database:³

$$K^{INI\ s,l,m} (USD) = Unit\ K^{l,m} * Customers\ IBNET^{s,l}$$

Where:

- $K^{INI\ s,l,m}$: Estimated asset base for each service l , of size m for s utilities in the IBNET database
- $Unit\ K^{l,m}$: Unit asset base for each service l , of size m
- $Customers\ IBNET^{s,l}$: Customers in each service l , for s utilities in the IBNET database

Our next step is to estimate the cost of capital for each country represented in the IBNET database. To do this, we first calculate a pretax weighted average cost of capital (WACC). This cost of capital reflects the opportunity cost of a water or sanitation utility without considering country-specific risks. But almost all regulators in emerging economies add a country-specific risk premium to account for

TABLE B.1. Average Unit Asset Base of 15 Chilean Utilities, Categorized by Size of Customer Base

Category	Customers	Unit asset base (\$/customer)		
		Water	Sanitation (*)	Total
Large	200,000+	3,717	4,794	8,512
Medium	100,000–200,000	5,342	4,602	9,944
Small	0–100,000	6,411	4,662	11,073

Source: Authors' elaboration of SISS information.

Note: (*) Though the difference is not statistically significant, large utilities display a slightly higher value for sanitation assets per customer, probably because of differences in how each utility reports its assets.

differences in risks among countries.⁴ In line with this practice, we then estimate the cost of capital for each country represented in the IBNET database by adding a country-specific risk premium to the cost of debt and the cost of equity.

Once we have an estimate of the cost of capital and the asset base for each service provided by each utility, we can compute both depreciation and capital remuneration by calculating an annuity:

$$D^s + \text{real } r^s \text{ pretax} * K^{INIs} = \frac{K^{INIs}}{\left(1 - \left(\frac{1}{(1 + \text{real } r^s \text{ pretax})^n}\right)\right) / \text{real } r^s \text{ pretax}}$$

Where:

- K^{INIs} : Estimated asset base for each utility s in the IBNET database
- D^s : Estimated depreciation for each utility s in the IBNET database
- $\text{real } r^s \text{ pretax}$: Pretax cost of capital in real terms for utility s
- n : 35-year life span of a greenfield

The use of an annuity instead of separate values for depreciation and return on capital serves two purposes. First, it simplifies the calculations. Second, the use of a constant annuity implies adopting an increasing pattern of depreciation. Given that we evaluate capital over a 35-year period, an increasing depreciation rate provides the correct allocative signal, since the system is bound to have excess capacity at the beginning of the period.

To estimate operation and maintenance (O&M) costs, we have analyzed different alternatives including reported values from IBNET in 2017 U.S. dollars. We computed an efficient tariff using estimated O&M costs. In general, during tariff revision processes, and in particular when estimating long-run marginal

costs, a “rule of thumb,” based on a percentage of total assets, is used to estimate annual O&M costs when no detailed information is available. The reference values generally used lie between 2.5 percent and 3 percent of invested assets. For the purposes of this study, the upper limit of 3 percent was assumed as a reference value. When this methodology is applied to all utilities represented in the IBNET database, O&M costs represent an average 24.7 percent of total efficient costs, which is similar to the average 28 percent figure from our sample.

We compute a real pretax WACC, so the tax cost is reflected in the discount rate and not in the cash flow. Using the total assets for water and sanitation separately for each utility and the cost of capital (corresponding to the country in which the utility is located), we can estimate the water and sanitation annuities covering the depreciation and return on capital. To determine efficient O&M we use a fixed proportion of the value of total assets. For this exercise we assume O&M costs to be 3 percent of total assets per year for both water and sanitation services. From the efficient revenue requirements, we can estimate an **efficient average tariff**, individually for both water and sanitation, by dividing the total revenue requirement by total sales (as reported in IBNET), formally:

$$T_{\text{Efficient}} = \frac{RR}{\text{Demand}}$$

Where:

- $T_{\text{Efficient}}$: Efficient tariff
- RR : Revenue requirement
- Demand : Sales by utility s as reported by IBNET

The tariffs computed up to this point are intended to recuperate the capital and O&M costs of an efficient model utility. But this assumption of efficiency is unrealistic: most utilities present inefficiencies. The inefficiencies we consider are

interwoven with operational expenditures. Most have to do with overstaffing and water production losses, as well as with capital expenditures, since extra assets are required to increase production to make up for the water losses incurred. The objective of this step is to compute a tariff that reflects the effective level of efficiency of each utility in terms of two variables: losses and labor costs. We call this a full tariff, since it allows a return compatible with a utility's opportunity cost of capital (i.e., to be economically sustainable) with costs including a certain level of inefficiency.

a. **Losses:** We assume that a minimum nonrevenue water loss of 15 percent is to be expected regardless of how efficient a utility is. We label the difference between this and a utility's actual, total losses as "inefficient losses." A higher level of losses implies higher costs. In terms of O&M, higher losses are linked to the use of more energy and chemical products. On the capital side, higher losses imply greater investment to cover the additional production needed to serve customers. To account for this cost differential, we estimate the incremental cost associated with the difference between the 15 percent assumed in the model utility estimate and the level reported in IBNET with the following formula:

$$\Delta C_{losses}^s = \Delta O\&M_{losses}^s + \Delta CAPEX_{losses}^s$$

Where:

ΔC_{losses}^s : Total cost differential associated with higher losses for utility s

$\Delta O\&M_{losses}^s$: O&M cost differential associated with higher losses for utility s

$\Delta CAPEX_{losses}^s$: CAPEX differential associated with higher losses for utility s

$$\Delta O\&M_{losses}^s = (EC^s + CC^s) * (ToL^s - TeL)$$

$$\Delta CAPEX_{losses}^s = \frac{(ToL^s - TeL)}{(1 - ToL^s)} * (K^{s,Prod,m} * Customers_{IBNET^{s,Water}})$$

Where:

EC^s : Reported electricity costs for utility s

CC^s : Reported chemical costs for utility s

ToL^s : Reported total losses for utility s

TeL : Efficient total losses from the Chilean sector

$K^{s,Prod,m}$: Estimated asset base for water production services of size m for utility s in the IBNET database

$Customers_{IBNET^{s,Water}}$: Reported water customers of utility s in the IBNET database

Finally, in denoting the total sales of utility s as *Demand*, we can compute a tariff differential as:

$$T_{losses} = \frac{\Delta C_{losses}}{Demand}$$

b. **Labor costs:** The model assumes by definition an efficient level of employees per customer. The efficient ratio of employees per customer² we adopt is based on our sample of Chilean model utilities, using a weighted average for each size category, as shown in table B.2. In general, most water and sanitation providers, particularly in low- and middle-income countries, have staff numbers that are substantially higher than the values we estimate as efficient.

TABLE B.2. Efficient Ratio of Employees to Customers

Category	Customers	Employees/1,000 customers
Large	200,000+	2.4
Medium	100,000-200,000	4.4
Small	0-100,000	5.2

Source: Authors' elaboration of SISS information.

Overstaffing implies higher costs in terms of O&M. To account for this cost differential, we estimate the incremental cost associated with the difference between (i) the number of employees per 1,000 customers assumed in the model and (ii) the level reported in the IBNET sample, using the following formula:

$$\Delta C_{employees}^s = Labor\ Costs^s - \left(\frac{Labor\ Costs^s}{Staff^s} * optimal\ staff\ ratio * MAX \left(Customers\ IBNET^{s,Water}, Customers\ IBNET^{s,Wastewater} \right) / 1000 \right)$$

Where:

$\Delta C_{employees}^s$:	Total cost differential associated with overstaffing in utility <i>s</i>
<i>Labor costs</i> ^s :	Reported labor costs of utility <i>s</i>
<i>Staff</i> ^s :	Reported number of employees in utility <i>s</i>
<i>Optimal staff ratio</i> :	Efficient ratio of employees per 1,000 customers
<i>Customers IBNET^{s,Water}</i> :	Reported number of water service consumers of utility <i>s</i> in IBNET database
<i>Customers IBNET^{s,Wastewater}</i> :	Reported number of wastewater service consumers of utility <i>s</i> in IBNET database

Based on this formula we estimate the cost and tariff differential associated with inefficient levels of employment for each utility in IBNET:

$$T_{Employees} = \frac{\Delta C_{employees}}{Demand}$$

Once we have computed the cost differential associated with water losses and staffing levels, we

calculate the full tariff for each utility in IBNET, adding these two elements to the efficient tariff computed. Formally:

$$T_{Full} = T_{Efficient} + T_{losses} + T_{Employees}$$

Where:

T_{Full} :	Full tariff
$T_{Efficient}$:	Efficient tariff
T_{losses} :	Tariff differential due to excessive losses
$T_{Employees}$:	Tariff differential due to overstaffing

While the tariff differential due to excessive water losses is exclusively allocated to the water tariff, the tariff differential due to overstaffing is distributed across water and wastewater services proportionally based on the respective asset bases. One of the main problems with subsidies is that they create allocative distortion. Since the price users pay is below the economic cost of providing the service, consumption is higher than what is socially optimal. Following Harberger (1971), a subsidy can be decomposed into two effects: a transfer given and an allocative distortion. On the one hand, the subsidy implies a monetary transfer to consumers. As they face lower prices for water and sanitation services they are left with a larger disposable income. On the other hand, lower prices incentivize a higher level of consumption of the subsidized service or product, so consumers increase their consumption above the optimal level. This creates a distortion in the allocation of resources in the economy—a distortion that can be measured.

The degree of allocative distortion created by the subsidy is a direct function of two elements: the relative size of the subsidy and the price elasticity of demand. Clearly, the larger the subsidy, the greater the increase in consumption. Price elasticity measures the proportional change in the quantity demanded of a good, given a 1 percent change in its price. The greater the elasticity, the greater the

distortion associated with a subsidy. If the price elasticity is zero, there is no distortion, since the quantity demanded is the same across all prices. Using this analytical framework, we can estimate the size of the deadweight loss associated with tariff subsidies in the water supply and sanitation sector. For the purpose of this exercise we use some international comparators and choose a price elasticity in the lower range. This will give us a lower bound for the allocative inefficiency associated with the existing tariff subsidies. Table B.3 shows the range of price elasticities estimated by different authors in different countries.

The estimates in table B.3 were obtained through a variety of methodologies studying both short- and long-term elasticities among residential and commercial consumers. The results vary within a small range in the short term, between 0.11 and 0.17, but the difference reaches 0.33 in the long term. Based on these available comparators we assume a price elasticity of 0.10. This means that a 10 percent increase in price will produce a 1 percent decrease in the quantities consumed. This reflects the short-term range of elasticities adopted by Boistard (1993). In the long run—as the economy adapts to higher

prices for water and sanitation service—the adjustments are larger. Again, this means that the estimate is a lower bound for the efficiency gains expected in the medium and long term as a result of a better-designed subsidy scheme. It is important to note that the elasticity concept refers to marginal changes in prices and quantities. Applying nonmarginal changes in prices—as done in some countries to simulate a shift from an inefficient tariff to one reflecting full cost-recovery—results in values that need to be considered very carefully, with several caveats in mind.

The allocative inefficiencies associated with water and sanitation subsidies for each utility are equivalent to the difference between the quantity of water that would be consumed under efficient O&M and actual water use. To estimate consumption under efficient O&M, we use the average tariff revenue for each utility's service and compare it with the efficient cost tariff for that service. Assuming a linear demand and a price elasticity of 0.10, we estimate the impact on consumption levels. Formally:

$$\text{Efficient Consumption} = \frac{\text{Demand}}{1 + \left(\frac{T_{\text{Efficient}} - \text{AvgR}}{\text{AvgR}} * \epsilon \right)}$$

Where:

- $T_{\text{Efficient}}$: Efficient tariff
- AvgR: Average revenue
- ϵ : Elasticity
- Demand: Total sales

Extrapolating Subsidy Costs within Countries

IBNET contains data for utilities in 91 countries,⁶ but not all utilities providing either water or sanitation services in each country are included in the database. We can measure the degree of coverage for water and sanitation services individually in each country by comparing the population served by utilities listed in the IBNET database with the total population served

TABLE B.3. Estimated Price Elasticities in Water and Sanitation, by Study and Estimate

Author(s)	Year	Sample location	Price-elasticity estimation
Carver and Boland	1980	Washington, DC	0.1 or less
Boistard	1993	France	0.11–0.33
Hanke and Mare	1982	Sweden	0.15
Katzman	1977	Malaysia	0.1–0.2
Hansen	1996	Denmark	0.1 or less
Grafton et al.	2011	10 OECD countries	0.429

Source: Authors' compilation.

Note: OECD = Organisation for Economic Co-operation and Development. The range adopted by Boistard (1993) is based on a survey of various studies of residential elasticity. Hansen (1996) estimates a water demand function for domestic households on pooled time series data to calculate both energy cross-price and water-price elasticities.

in the country overall. This last value is estimated using total coverage data from the World Health Organization/United Nations Children's Fund and population data from the World Bank. In the first of these databases, coverage rates are differentiated by type of facility (piped and nonpiped facilities for water; and sewerage, latrine, and septic tank facilities for sanitation).² The total population served in each country for each service was therefore computed by multiplying the coverage rate for piped water and sewerage coverage, respectively, by population data from the World Bank. By dividing the total population served in a country by the population served in IBNET, we compute an extrapolation factor for each service. Assuming that the average tariff charged by utilities not included in IBNET is equal to that of the utilities in IBNET—and that the average efficiency of both groups is also similar—we estimate total subsidies at the country level by multiplying the total subsidies of the service for utilities in IBNET by the extrapolation factor for that service. The total estimated subsidy level for the water and sanitation sector in each country is then the sum of the water and sanitation service subsidies in that country. A few countries represented in the IBNET database were estimated to have a negative subsidy (estimated full tariffs were greater than the observed average tariffs). Most of these were high-income countries, where efficiency may exceed the level assumed in the model. Where this was the case, subsidies were assumed to be 0. Using data on gross domestic product for the year 2015 from the World Bank, we calculate subsidies as a percentage of gross domestic product.

Extrapolating Subsidy Costs for Countries with Data Gaps

First, we separated out China and India, while the remaining countries were grouped into four clusters—high income, upper middle income, lower

middle income, and low income—based upon the World Bank's country classifications by income for fiscal year 2019. Next, for water and sanitation separately, we calculated an average subsidy per person served, using IBNET data, as available, for countries in the four groups (see appendix C). Then, for countries not in the IBNET database, we multiplied this per person subsidy by the total population served by the respective service (estimated by multiplying the country's coverage rate⁸ and its total population). Due to a lack of data, China and India were both excluded from our estimates.

Sensitivity Analysis

The main drivers for these estimates are the unit cost in the asset base calculations. The results presented in the report assume a +/-10 percent variation in the unit asset base estimates.

Notes

1. See more details about the methodology in background paper 2 (listed in appendix A).
2. See Chilean law 70 from 1988.
3. In case of missing sanitation data in the IBNET database, if only one of a utility's number of sewerage connections or volume of wastewater processed was missing, the analogous data from the utility's water coverage were used in its place (sewerage customers = water customers or wastewater treated = water sold). Utilities without any sanitation data were classified as water-only providers.
4. Country-specific risk premiums can be found at Damodaran: <http://www.damodaran.com>.
5. A generally accepted benchmark for staff efficiency is 5 employees for every 1,000 customers, although we refrain from using this, since it does not reflect economies of scale and thus may result in the illusion that large companies have efficient staffing levels.
6. China and India were not extrapolated due to low proportional representation in IBNET and a general lack of data availability.
7. Water and/or sanitation coverage data for six countries (Bahrain, Fiji, Indonesia, Kosovo, Kuwait, and Solomon Islands) were incomplete, and were thus supplemented by additional data and estimates.
8. Water and/or sanitation coverage data from the World Health Organization/United Nations Children's Fund for three countries (Austria, Isle of Man, and Micronesia), in addition to the six previously cited with partial IBNET data, were incomplete, and were thus supplemented by additional data and estimates.





APPENDIX C

Building Political Coalitions to Support Reform

Building upon section 4.2, this appendix provides additional guidance to policy makers regarding the conditions and strategies that can be harnessed and employed to promote subsidy reform. A subsidy reform may seek to shift the equilibrium represented in table C.1 (identical to table 4.2 in chapter 4), but of the four equilibria outlined there, none is preferable in all contexts.

For example, a well-targeted subsidy that seeks to exclusively benefit the poor should strive toward case 2, while a reform program seeking to gradually remove subsidies in order to attain cost-recovery tariffs should strive toward case 4. Note that only those situations where costs accrue largely to the government (taxpayers) while benefits accrue to interest groups and the general populace are considered in these four cases. In reality, the costs borne by citizens and interest groups would need to be considered in any comprehensive political economy analysis.

To design feasible reforms and implementation plans, it is crucial to figure out the current political equilibrium in a country and to develop a strategy for how to shift the status quo. A detailed description of each type of case, as well as possible strategies for reform in each context are provided below.

Case 1: Generalized Benefits Are Large, as Are Benefits to Interest Groups

An example of case 1 is when all consumption is substantially subsidized, and access to networked services is universal. Large users benefit exponentially, but average citizens also see a significant contribution to their household budgets. Large benefits typically lead to fiscal unsustainability. This is because all citizens benefit without much concern about the costs, especially when these are deferred to the future or hidden in complex institutional arrangements. A large portion of benefits may go to special interest groups with significant political power or to wealthier segments of society. Governments tolerate this situation when they gain electoral and other benefits from the subsidy and are not forced to deal with its costs. (Box 4.1 in chapter 4 describes a successful reform strategy used by Iran to remove a case 1 subsidy.)

TABLE C.1. Characterizing Subsidy Policy Benefits: Basic Framework

	Generalized benefits are large	Generalized benefits are small
Interest group benefits are large	Case 1	Case 2
Interest group benefits are small	Case 3	Case 4

Source: Adapted from Inchauste, Victor, and Schiffer (2018: 11).

Found in: Countries with near-universal access and increasing block tariffs, where most consumption falls within subsidized blocks (especially common in East Asia and Pacific, Latin America, and Middle East and North Africa).

Successful reforms of case 1 subsidy: Argentina (to case 2), Chile (to case 2), Peru (to case 2), Iran (removed/replaced with cash transfers).

In case 1, the likelihood of subsidy reform increases when some or all of the following conditions are present:

- The government communicates a strong, simple, and credible narrative, outlining the risks of the status quo, breaking complex economic processes down to a simple relatable logic.
- Citizens develop a better understanding of how the existing system is harmful to their interests—by, for example, effectively redistributing public funds mainly to the wealthy—and mobilize to counter it.
- The government credibly commits to citizens and interest groups that policy reforms will leave them either better off or the same. This may require offering them medium-term benefits to offset the loss of subsidies.
- Interest groups that would oppose reform find it difficult to mobilize, or the government finds a way to satisfy their core aims.

- The costs of providing benefits rise sharply (e.g., because of a fiscal crisis or impending water security crisis).
- The costs of subsidies are not sustainable, coupled with declining service quality.
- External pressure from donors or lenders changes the political equilibrium.

By contrast, reform is less likely under the following conditions:

- Interest groups are effective in developing compelling narratives against the reform to galvanize citizen protests.
- Powerful government officials are making large illegal financial gains and stand to lose from reform.
- Governments promise to replace subsidies with cash transfers to average citizens, but fail to adopt credible plans, such that citizens do not believe the promised transfers will materialize.

Case 2: Generalized Benefits Are Small, and Benefits to Interest Groups Are Large

Case 2 may involve several circumstances. Supply-side subsidies may not benefit citizens noticeably, if at all, if service providers pocket the additional revenue without passing any value on to the consumers. Or the intended beneficiaries may not benefit from the subsidies either because of chronic service interruption or because of a lack of access to the subsidized service (which disproportionately benefits the rich). It is important to note, however, that case 2 may also involve a subsidy that is well targeted to its intended beneficiaries, most likely the poor. Therefore, case 2 is an ideal outcome of a subsidy that seeks to make WSS services affordable to the poor. However, case 2 may equivalently involve a poorly targeted subsidy that significantly benefits

unintended and/or nonpoor beneficiaries. As a general rule, subsidies of this type persist because they benefit a powerful but small fraction of the population, or their costs are not large enough to have substantial, broad-based impacts on the functioning of the economy and the public budget.

Found in: Countries with targeted subsidies benefiting particular interest groups, whether the poor (such as in Argentina and Chile through means testing, or Kenya and Uganda through service differentiation and connection subsidies) or special interest groups (such as Albania through political favoritism); also, countries with subsidized networked services and low access for the poor (common throughout Sub-Saharan Africa).

In case 2, the likelihood of subsidy reform increases when some or all of the following conditions are present:

- Governments credibly provide special interest groups with alternative benefits to replace those lost via reform. If the poor are indeed benefiting from a subsidy, the government may want to introduce direct cash transfers.
- Citizens or dispersed interests who would gain from larger government revenue develop a better understanding of the price they pay for current subsidies, and the possible benefits of reform. They then mobilize in their own collective interests. To promote this, a government might facilitate citizens' participation in the reform design process, and raise awareness of positive social outcomes.
- The administration changes, and benefiting interest group(s) lose their influence over key politicians.
- The costs of providing benefits rise sharply (e.g., because of a fiscal crisis or impending water security crisis).

- External pressure from donors or lenders changes the political equilibrium.

By contrast, reform is less likely under the following conditions:

- The total cost of the subsidy is small, such that the political and financial cost of reform may outweigh its benefits.
- Interest groups develop strong narratives that convince the general public that they will lose from the reform.

Case 3: Generalized Benefits Are Large, and Benefits to Interest Groups Are Small

Case 3 generally involves subsidies that are intended to benefit most households, such as low residential tariffs. As with case 1, providing large benefits to citizens likely implies a lack of fiscal sustainability. Yet unlike case 1, there are no interest groups that reap significantly greater benefits than the average household. In these settings, citizens may be well organized enough to demand subsidies from politicians, who then perceive subsidies as a means to gain broad-based political support.

Found in: Countries with near-universal access and subsidized common infrastructure expenditure or subsidized fixed costs.

In case 3, the likelihood of subsidy reform increases when some or all of the following conditions are present:

- Broad public support is no longer pivotal to electoral success.
- The government can credibly communicate, offer, and administer alternative systems, such as direct cash transfers, to target the poor.
- The costs of providing benefits rise sharply (e.g., because of a fiscal crisis or impending water security crisis).

- Politicians shift their mindset regarding the need for free or low-cost water.
- External pressure from donors or lenders changes the political equilibrium.

By contrast, reform is less likely under the following conditions:

- Governments fear mass mobilization and public protest in response to subsidy reform.
- Governments continue to perceive the existing subsidy as crucial to their political survival.

Case 4: Benefits to Both the General Populace and to Interest Groups Are Small

In case 4, no interest group, organized or general, benefits exceptionally. Because the benefits to all groups are negligible, the need to overcome

significant political opposition from any interest group is unlikely. Although per-household or per-business subsidies may be small, the total cost of the subsidy could still be large, therefore increasing government incentives to undertake reform and reallocate scarce public resources to a more productive purpose. Conversely, if the cost of the subsidy is small, the fiscal pressure on the government to reform the subsidy may also be small, thus reducing the likelihood that the government would champion reform. It should be noted that a case 4 equilibrium, by definition, implies that a subsidy is ineffective at attaining its goals, since even the intended beneficiaries are not significantly impacted.

Found in: Countries with subsidies that provide insignificant benefits to all users, but that may still represent a significant fiscal burden.

