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Pipe(d) Dreams

Water Supply, Sanitation, and Hygiene Progress and Remaining Challenges in Ecuador

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Executive Summary

Status of Water Supply and Sanitation Access for the Poor and Vulnerable Populations

Long-term trends in the coverage of water supply and sanitation (WSS) show consistent improvement in water and sanitation coverage in Ecuador since the 1990s. Ecuador has been steadily improving both water supply and sanitation coverage since 1990.[1] Indeed, between 1990 and 2015, access to improved water supply (i.e., piped water or other improved sources) increased by 13 percentage points, reaching 87 percent of the population, and improved sanitation increased by 28 percentage points, reaching 85 percent. Coverage improved most dramatically in rural areas, as in urban areas it was already high in the early 1990s. As a result, coverage rates in rural areas have started converging with the high improved coverage rates in urban areas, but gaps still remain.

Despite a significant increase in investment in the last decade, however, these trends have not accelerated in rural or urban areas. Despite increased policy attention and investments in the sector by the current government, the long-term positive trend of coverage actually slowed slightly in the last decade.[2] This slowdown reflects the increasing marginal cost of closing the gaps in the rising coverage levels, as those who are not covered are typically households in remote areas. But it also reflects a fundamental aspect of the way WSS investments are made in the country, where municipal governments are the main authorities responsible for undertaking investment in WSS. As a result, large municipalities have been able to invest much larger amounts, even if these investments are not aimed at closing coverage gaps with remote and underserved areas.

At the same time, access to safely managed water and sanitation is significantly lower than previously reported under the Millennium Development Goals (MDGs). As part of the Water Supply, Sanitation, and Hygiene (WASH) Poverty Diagnostic (WPD), new data were collected to measure access to safely managed services following the Sustainable Development Goals (SDG) definition. The results were striking: just 72.5 percent and 25.1 percent of Ecuadorans have access to safely managed water and to safely managed sanitation services, respectively.[3] Furthermore, evidence on quality of water shows that 33 percent of the water consumed in rural areas and 15 percent in urban areas is contaminated with the *E. coli* bacteria.

Regional disparities in access to improved WSS are still significant. Analysis of the coverage of improved water and sanitation by household-level characteristics in 2006 and 2014 shows that a large portion of the improvements at the national level are driven by urban areas, in particular the largest cities (Quito and Guayaquil), while unimproved sanitation remains high in secondary cities, and more so in rural areas. Between 2006 and 2014, improved sanitation increased by more than 20 percentage points in Guayaquil and in rural areas. Urban areas have prioritized public sewerage investments, whereas improvements in rural areas were largely attributable to septic tank solutions, which are mostly private investments. Location and poverty are strong predictors of lacking access to improved WSS.

The gap between the top 60 percent and the bottom 40 percent has narrowed more for improved access to water than for improved access to sanitation. Between 2006 and 2014, access to improved WSS increased relatively more among the bottom 40 percent of households; septic tank solutions explained the majority of improved sanitation increases. However, for the vulnerable segments, improvements have been slower, as their coverage with improved

water and sanitation in 2014 was below the coverage of higher-income segments in 2006. Finally, although indigenous and Afro-Ecuadorans still have lower improved water coverage than mestizos, there has been significant progress, especially for indigenous households. As for improved sanitation services, although coverage increased for indigenous people (mainly with septic tank solutions), it remains significantly lower than for other ethnic groups.

Implications for Human Development Outcomes

Despite the recent advances in poverty reduction and improved WSS access, Ecuador is still struggling to combat chronic malnutrition. Chronic malnutrition (or stunting) in children under three years old is one of the main human development failures in Ecuador, affecting almost one in four urban children under three and a higher proportion among rural children. Despite a considerable improvement in living conditions among poor families in Ecuador and large investments to tackle this issue, the results have been disappointing: in 10 years, the incidence of chronic malnutrition has barely declined at all.

An analysis of the synergies of improved access to WSS and other dimensions affecting stunting shows that improved WSS combined with other interventions in other dimensions are associated with lower stunting. The analysis looked at four basic dimensions of care that are critical for the healthy development of children: health, feeding, care, and WSS services. The results show that two or more adequate dimensions are significantly and positively related to nutritional status, and their combined impact is of larger magnitude than that of a single dimension (except for food), and that WSS services have significant synergies with other dimensions.

An analysis of the risk of diarrheal disease in children finds that universal access to WSS would significantly reduce risks for poor children in certain areas of the Coast and Amazonia. The analysis finds that the burden of enteric diseases associated with inadequate WSS is 2,500 disability-adjusted life years (DALYs) per 100,000 children per year, which is approximately 66 percent of the total burden of enteric diseases in the country. The analysis also indicates that nationally the WSS enteric burden for the lowest quintile is about 30 times greater than for the highest quintile.[4] Although the WSS-related enteric burden is lower in urban than in rural populations, there are disparities within each population: the burden for the poorest is 25 times higher than for the richest in urban areas, and 3 times higher in rural areas. The study zeros in on a number of provinces that present high exposure to disease, concluding that providing universal access to piped water on premises to all households would more than halve this risk in the provinces of Manabí, Los Ríos, Napo, Guayas, and Santa Elena. Likewise, providing access to a flushed toilet connected to a septic tank or cesspool to all households currently using unimproved facilities would at least halve this risk in Santa Elena, Napo, and Los Ríos.

An intervention seeking to bring about nutritionally beneficial behavioral changes among infants' caregivers in rural Chimborazo through text messaging shows a promising positive impact, both in reducing nutrition-related disease and in improving growth-related outcomes. Chimborazo is a predominantly indigenous and rural province that suffers from extremely high rates of chronic malnutrition, with 49 percent of children under five stunted in 2012.[5] Poverty affects 53 percent of households, and the 2010 Census reports that approximately 20 percent of the rural population in the province had no access to any type of bathroom or latrine, only 30 percent had piped water within the house, and only 42 percent had access to a public water source—clear structural barriers to good hygiene, with implications for the nutrition of children.

The *Texting for Nutrition* project used text messages to improve nutrition and health outcomes for children by encouraging a change in caregiver health behavior. Over the course of 14 months, beginning in January of 2015 and ending in March of 2016, caregivers participating in the project received 75 text messages encouraging a unique set of behavior changes.

The intervention improved anthropometric measures of nutrition. The project brought about a statistically significant improvement in weight-for-age z-scores in the population under two years of age, a positive increase of 0.35 of a standard deviation for the treatment group as compared with a control mean of 0.84 standard deviation below the international mean. The results show that the intervention caused a large decline in the experience of illnesses in the preceding two weeks, as reported by caregivers. Children in the treatment group were 30 percent less likely than children in the control group to have had a cough or respiratory illness in the preceding two weeks. Caregivers observed reductions in experience of respiratory illness, fevers, and hospitalization in children in households which received text messages on water supply, sanitation, and hygiene behavior change.

Constraints on Improving Service Delivery for the Rural Population

An analysis of the institutional arrangements for rural WSS finds that rural municipalities face significant challenges in providing better services. Since 1945, Ecuadoran law has designated municipal (canton) governments as the authorities responsible for the delivery of WSS, including for investment in WSS infrastructure and services. However, a historical focus on developing urban areas generated coverage gaps that remain today. Starting in the 1960s, community-based organizations with very low technical capacity took the initiative to provide WSS to local households, without any government support. Subsequent legislation in the 1970s recognized these organizations, called Community Organizations for Access to Water and Sanitation (OCSAS in the Spanish acronym, Organizaciones Comunitarias de Servicios de Agua y Seaneamiento), as legitimate service providers, but did not provide mandates for coordination of financial support between municipal governments and Community Organizations for Access to Water and Sanitation (OCSAS). As a result, where OCSAS operate as WSS providers, most municipal governments have not taken any leadership role or invested in improving infrastructure or the quality of the services.

Despite the small size of the country and the relatively smaller size of the rural population (about 35 percent), the WSS sector is extremely fragmented in rural areas, which creates a serious scale problem. Although the exact number of OCSAS is not known, an estimation based on their average size suggests that the total number of operational OCSAS in Ecuador is about 5,000. According to a survey conducted by SENAGUA in 2016 among representatives of 2,730 OCSAS, the average OCSAS in Ecuador supplies water to only 162 households, and it does not provide any sanitation services. The majority (61 percent) serve fewer than 100 households, and only 6 percent serve more than 500 households.

Moreover, the financial situation of OCSAS is extremely precarious. The average total monthly billing per OCSAS is US$354, while their average monthly income is US$249 (a collection efficiency of 70 percent). This means that billing and revenue *per customer* are on average US$2.01 and US$1.41, respectively. Only a third of OCSAS have a bank account. As a result of this financial situation, OCSAS also have few employees and very low human capital. Less than a third of them have full-time employees, and those employees earn a minimum wage on average, while more than half use volunteer workers (1.3 volunteers on average), who are paid about US$100 per month in compensation.

Understandably, the quality of the services provided is also low. A study of a particular type of OCSAS which operates in rural communities, mostly in the Sierra region, shows that only 43 percent of them conduct a daily water disinfection process. Part of the problem pertains to low budgets, but there is also low technical capacity, especially in the smaller organizations, in addition to limited access to supplies.

Public-community partnerships between OCSAS and municipalities could help. Given the lack of scale and low coordination with municipal governments, the current legal framework

encourages establishing public-community partnerships as a vehicle to strengthen OCSAS, to improve the quality and sustainability of services. The idea is to empower local governments, community-based organizations, and national government dependencies to collaborate in activities such as participatory planning and budgeting, ordinance enforcement, and investment, so that the weaknesses of OCSAS are addressed. Although the number of such partnerships in place is relatively low (given the large number of OCSAS), there are a few cases that can be analyzed to draw a few lessons.

For instance, in the Cañar province, the poorest canton (also called Cañar) demonstrates a positive experience of a successful public-community partnership to solve problems of low quality and limited access to water. Since 2002, the canton has had a model public-community partnership for rural water management within the Center for the Rural Management of Drinking Water (CENAGRAP in its acronym in Spanish: Centro de Apoyo a la Gestión Rural de Agua Potable). This is a decentralized entity that feeds from community participation and is responsible for the technical, social, judicial, administrative, and financial support of community organizations to improve the quality and sustainability of service.

Regarding the planning process and participatory budgeting, the province of Cañar has identified water as a priority in its territorial planning, in terms of both service delivery and the protection of water charge zones. The allocation of a participatory budget has a system with indicators to prioritize. Budget allocation by CENAGRAP is regulated by cantonal ordinance. It establishes a yearly minimum value, and it varies according to each year's municipal budget. Cañar province transfers financial resources on an annual basis, and the actions undertaken with these resources are previously discussed and agreed with the Planning Office and validated in the CENAGRAP assembly.

Still, despite such successful cases, the limitations on accessing the capital needed for increased investment continue to pose a challenge. Unfortunately, the positive experience observed in Cañar is not widespread. In fact, not many municipalities have been able to structure successful collaboration mechanisms with OCSAS that establish well-defined roles and involve planned coordination. But even in successful cases such as Cañar, the ability of local governments (municipalities) to raise large amounts of capital to invest in better WSS infrastructure and maintenance is extremely limited. First, the central government's main financing arm, the Development Bank of Ecuador (BDE in its acronym in Spanish: Banco de Desarrollo de Ecuador) uses strict financial feasibility criteria to provide investment financing to municipalities. As a result, small, poor municipalities have very little access to this type of financing. Second, raising capital locally (through tariffs, for example) is also very difficult given the very low ability to pay of these customers and the traditionally weak collection capacity of the providers.

To facilitate the access of small rural municipalities to resources to improve their WSS delivery, it is necessary to change the current criteria and rules for investment financing in the sector. Current lending conditions offered by BDE for WSS projects could be relaxed for municipalities with weaker financial capacity and higher WSS investment needs. Given the low cost recovery rates in rural municipalities, incentives are needed to allow for municipal indebtedness in rural areas with BDE resources, and to secure even non-reimbursable funds. This should be done by incorporating criteria such as the municipality's capacity to partner with OCSAS. It is also important to reduce the barriers to use of BDE loans for rural WSS projects, for instance, by supporting efforts to update rural cadasters, promoting tax compliance in rural areas, and providing small financing loans for WSS projects implemented by municipalities. Finally, improving the effectiveness of technical feasibility approvals would reduce arbitrary allocations of budget across municipalities. Achieving improvement requires building capacity within SENAGUA to manage this process as well as the technical approval and assistance of plans to improve municipal rural WSS. Alternatively, this capacity can be delegated to other actors closer to local needs.

Notes

1. The Joint Monitoring Project (JMP) collects harmonized indicators of coverage for water and sanitation using available census and survey data worldwide. When it is not possible to measure these indicators directly, they are estimated indirectly.
2. According to the National Water and Sanitation Strategy (ENAS in its Spanish acronym—Estrategia Nacional de Agua y Saneamiento), investment in WSS increased nationally from approximately US$64 million in 2008 to US$225 million in 2016 (in current prices).
3. These results refer to the September 2016 pilot measurement, and thus differ from the official INEC indicators, which are based on the December round of ENEMDU. Moreover, INEC does not report the safe sanitation indicator, as it does not properly measure safe disposal of waste water for households with sewerage connection, and thus underestimates the access to safe sanitation services, especially in urban areas.
4. The "enteric burden" refers to the risk of contracting diarrheal disease from the combination of exposure and susceptibility.
5. ENSANUT 2013. Data made available in 2013 but collected in 2012. See Ministerio de Salud Publica (2014).

Reference

Ministerio de Salud Publica. 2014. Encuesta Nacional de Salud y Nutrición, ENSANUT-ECU 2012.

Abbreviations

ARCA	Agency for Regulation and Control of Water (*Agencia de Regulación y Control del Agua*)
BDE	Development Bank of Ecuador (*Banco de Desarollo de Ecuador*)
CEN	Country Engagement Note
CENAGRAP	Center for Rural Management of Drinking Water (*Centro de Apoyo a la Gestión Rural de Agua Potable*)
CPV	Population and Housing Census (*Censo de Población y Vivienda*)
DALY	Disability-adjusted life year
DHS	Demographic and Health Survey
ECV	Living Conditions Survey (*Encuesta de Condiciones de Vida*)
ENAS	National Water and Sanitation Strategy (*Estrategia Nacional de Agua y Saneamiento*)
ENDEMAIN	Demographic and Maternal-Child Health Survey
ENEMDU	National Survey of Employment, Unemployment and Underemployment
ENIEP	National Strategy for Equality and the Eradication of Poverty
ENIGHUR	National Survey of Urban and Rural Household Income and Expenditures
ENSANUT	National Health and Nutrition Survey
FECASAL	Spanish Fund for the Water and Sanitation Cooperation in Latin America and Caribbean
GAD	Autonomous decentralized government
IDB	Inter-American Development Bank
INEC	National Institute of Statistics and Censuses
JAAP	Juntas Administradoras de Agua Potable
JMP	Joint Monitoring Programme
LORHUAA	Organic Law of Hydric Resources and Water Resource Management
MCDS	Ministry of Coordination of Social Development
MDGs	Millennium Development Goals
MIES	Ministry of Social and Economic Inclusion (*Ministerio de Inclusión Económica y Social*)
MSP	Ministry of Public Health (*Ministerio de Salud Pública*)
MTOP	Ministry of Transport and Public Works (*Ministerio de Transporte y Obras Públicas*)
NBI (UBN)	Unsatisfied basic needs (*necesidades básica insatisfechas*)
OCSAS	Community Organizations for Access to Water and Sanitation (*Organizaciones Comunitarias de Servicios de Agua y Seaneamiento*)
PNBV	National Plan for Good Living (*Plan Nacional del Buen Vivir*)

PRM	Poverty risk model
RS	Social Registry (*Registro Social*)
SDG	Sustainable Development Goal
SENAGUA	Secretariat for Water Provision (*Secretaría Nacional de Agua*)
SENPLADES	National Secretariat of Planning and Development (*Secretaría Nacional de Planificación y Desarrollo*)
UNICEF	United Nations Children's Fund
WASH	Water supply, sanitation, and hygiene
WHO	World Health Organization
WPD	WASH Poverty Diagnostic
WSS	Water supply and sanitation

Chapter 1
Introduction

This synthesis report highlights the main results from the activities undertaken in the Ecuador Water Supply, Sanitation and Hygiene (WASH) Poverty Diagnostic (WPD). Through a set of analyses, the main purpose of the WPD within the Bank, in particular among water and sanitation specialists, was to provide the Water Global Practice with evidence-based knowledge and tools in order to mainstream poverty analysis in the strategies, portfolio plans, design and implementation of programs and projects. (For a description of the WPD, see box 1.1) In doing so, the Ecuador WPD team would simultaneously engage with other Practices (in this case the Poverty, Social Protection, and Governance Practices) and partners within the Government of Ecuador, in particular the National Water Authority (SENAGUA in its Spanish acronym: Secretaría Nacional del Agua), the Ministry of Coordination of Social Development (MCDS in its Spanish abbreviation: Ministerio Coordinador de Desarollo Social) and the National Statistical Institute (INEC in its Spanish acronym: Instituto Nacional de Estadisticas y Censos). In addition, the WPD Team benefited from support from the United Nations Children's Fund (UNICEF) and the Joint Monitoring Programme (JMP) to carry out part of the WPD activities. All of these happened between October 2015 and December 2016.

To this end, the WPD assessed the country's progress in providing equitable, improved access to WASH services through answering four questions which have been applied globally to other WPDs in 18 countries, as described below:

- Who are the poor and the bottom 40 percent of the national distribution, and where do they live? (chapter 2)
- What is the level of access to and quality of WASH services received by the poorest 40 percent, as compared with the remaining 60 percent of the population? (chapter 3)
- What are the linkages and synergies between WASH and other sectors; that is, what is the importance of the WASH sector for making progress with respect to health and nutrition indicators? (including the impact of inadequate services) (chapter 4)
- What are the WASH service delivery constraints and bottlenecks and the potential solutions in improving the provision of these services to the poorest 40 percent? (including the role of institutions) (chapter 5)

Whereas for the first three core questions (called CQ hereafter), most teams have followed a somewhat standard analysis using available quantitative information from the country, the Ecuador team innovated by integrating a subtask that included primary data collection to obtain a "Gold Standard for Measuring and Reporting SDG6 in Ecuador" that has produced revealing results. In CQ 4 the team had more flexibility for the analysis as it was restricted to one subsector. The team built on the first three questions but chose the rural water subsector for the analysis on the basis of results from CQ 2, the preliminary analysis done during the conceptual stage, and the country's knowledge of the team. Originally, the idea was to do a deep-dive analysis of the entire WASH system but owing to time and budget constraints it was limited to only analyzing the rural water subsector for constraints and opportunities to improve service delivery in these areas.

Box 1.1: The Water Supply, Sanitation, and Hygiene Poverty Diagnostic

The WASH (Water Supply, Sanitation, and Hygiene) Poverty Diagnostic (WPD) is a global initiative led by the World Bank's Water and Poverty Global Practices. Its aim in Ecuador was to develop an evidence base on the state of WASH and the linkages between poverty and WASH, in terms of access, quality, service delivery, and sustainability with respect to human development outcomes—particularly communicable disease and chronic malnutrition. The results of the WPD can guide the country policy dialogue so as to help steer the country's investment decisions toward closing key gaps in the sector, as well as to shape supply- and demand-side policies to better serve the bottom 40 percent of the income distribution and maximize human capital outcomes.

The WPD is envisioned to contribute in the following ways:

- *By informing the Systematic Country Diagnostic and Country Partnership Framework process*.
- *By mainstreaming poverty analysis into sector policy, dialogue, and strategies*. The WSS sector needs tailored information on poverty that is accessible to non-poverty specialists, so it can be mainstreamed, taken up, and used by sector specialists and government counterparts. This diagnostic also offers an opportunity to influence national data collection systems on poverty to harmonize WASH indicators and allow country systems to monitor progress among the bottom 40 percent.
- *By improving the targeting of programs and projects*. Understanding who and where the bottom 40 percent are located in a country and understanding their levels and quality of services will inform targeting of projects and programs.
- *By catalyzing a multidimensional response.* The WPD develops an evidence base to enable informed discussions within the World Bank Group on how to improve service delivery in water supply and sanitation and ensure that the bottom 40 percent benefit relatively more.

The Ecuador WPD built a comprehensive diagnostic of the status of water and sanitation access for the poor and vulnerable populations, the implications for human development outcomes, and the binding constraints on improving service delivery for the rural population. In this process, the Ecuador WPD made extensive use of data from household surveys (both existing and newly collected information) and qualitative evidence, as well as information from extensive focus groups. The wealth of knowledge, data and tools generated through the WPD has great potential to inform water practitioners and teams within the Bank and in the country to improve strategies, policies, and program targeting to get the best value for money from public investments in the sector as well as for future research and policy analysis.

Chapter 2
Poverty in Ecuador: Progress with Persistent Disparities

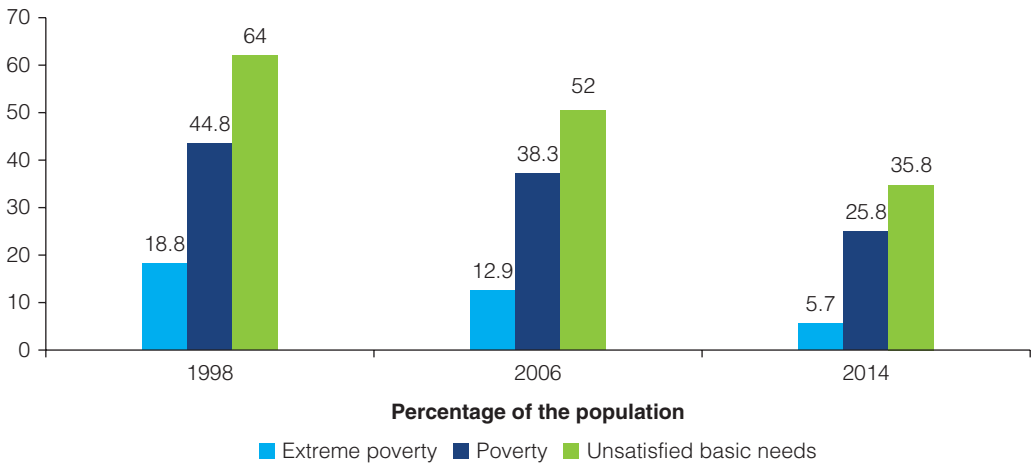
Ecuador has made great progress towards the eradication of poverty over the last 10 years. According to the most recently published Poverty Assessment elaborated by the World Bank and INEC, between 2006 and 2014 consumption-based poverty in Ecuador fell from 38 percent to almost 26 percent, a reduction of almost 13 percentage points; extreme poverty by consumption fell from 13 percent to almost 6 percent, a reduction of 7 percentage points (figure 2.1). [1,2]

There has been progress on all dimensions of poverty. The depth of poverty (the distance to the poverty line) and its severity (the degree of inequality among the poor) have been also significantly reduced during the past 10 years. The depth of poverty in particular fell by half, bringing the poor closer to escaping poverty. Poverty severity has decreased to less than half, meaning that the poorest of the poor have benefited relatively more from improvements in the standards of living. Moreover, poverty measured by unsatisfied basic needs (NBI in its abbreviation in Spanish: necesidades básicas insatisfechas) was also reduced in the same period from 52 percent to 36 percent (figure 2.1).

Impressive But Uneven Evolution of Poverty

Poverty reduction has been a flagship objective of the government in recent years. One of the main social goals of the 2013–17 National Plan for Good Living (PNBV in its Spanish abbreviation) is to reduce poverty by at least 80 percent by 2030. In that regard, the government

Figure 2.1: Consumption Poverty and Inequality, 1998–2014



Source: World Bank 2016b.

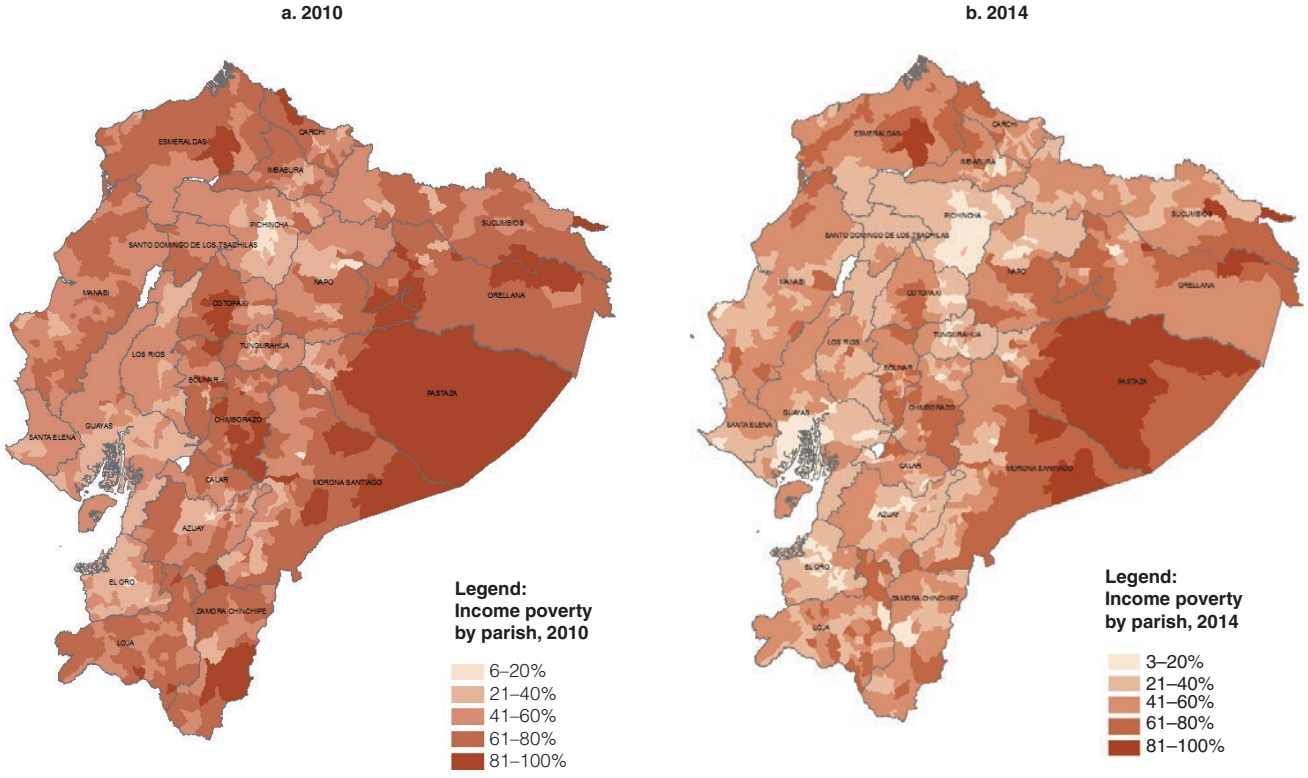
has placed significant emphasis on closing the gaps in poverty and access to services between population groups, both at the regional level and across socioeconomic ladders.

Indeed, there was progress in poverty reduction in urban and rural areas, as well as in the diverse natural geographic regions of the country.[3] Poverty in rural areas decreased 14 percentage points, whereas in urban areas the reduction was 9 percentage points. Extreme poverty in urban areas was virtually eradicated, with the extreme poor constituting less than 2 percent of the urban population. There has been similar progress in rural areas, where extreme poverty now affects only one in eight people. With respect to natural regions, poverty dropped 9 percentage points in the Highlands (Sierra), 15 percentage points in the Coast, and 12 percentage points in the Rainforest (Amazonia).

Despite the generalized progress, national figures show that poverty is still higher in rural areas and in the Amazonia region. Rural poverty incidence is three times higher than urban poverty incidence, and the incidence of extreme poverty is seven times higher. The Amazonia region presents the highest incidence of poverty and extreme poverty: poverty in the Amazonia is almost twice as high as in the Highlands and in the Coast. Despite the urbanization taking place in the country, rural settlers still represent more than 30 percent of the population.

Disparities also persist at the parish level, even within prosperous provinces.[4] Although the poverty incidence at the national level is 25.8 percent (in 2014), this average hides regional contrasts. Some provinces—such as Napo, Chimborazo, and Morona Santiago—have higher rates, with a poverty incidence above 50 percent. At the canton level, 27 percent (59 of the 221 cantons) have a poverty incidence above 50 percent. At the parish level, 45 percent (470 of the 1,037 parishes) have a poverty incidence above 50 percent (map 2.1).

Map 2.1: Poverty at the Parish Level, 2010 and 2014

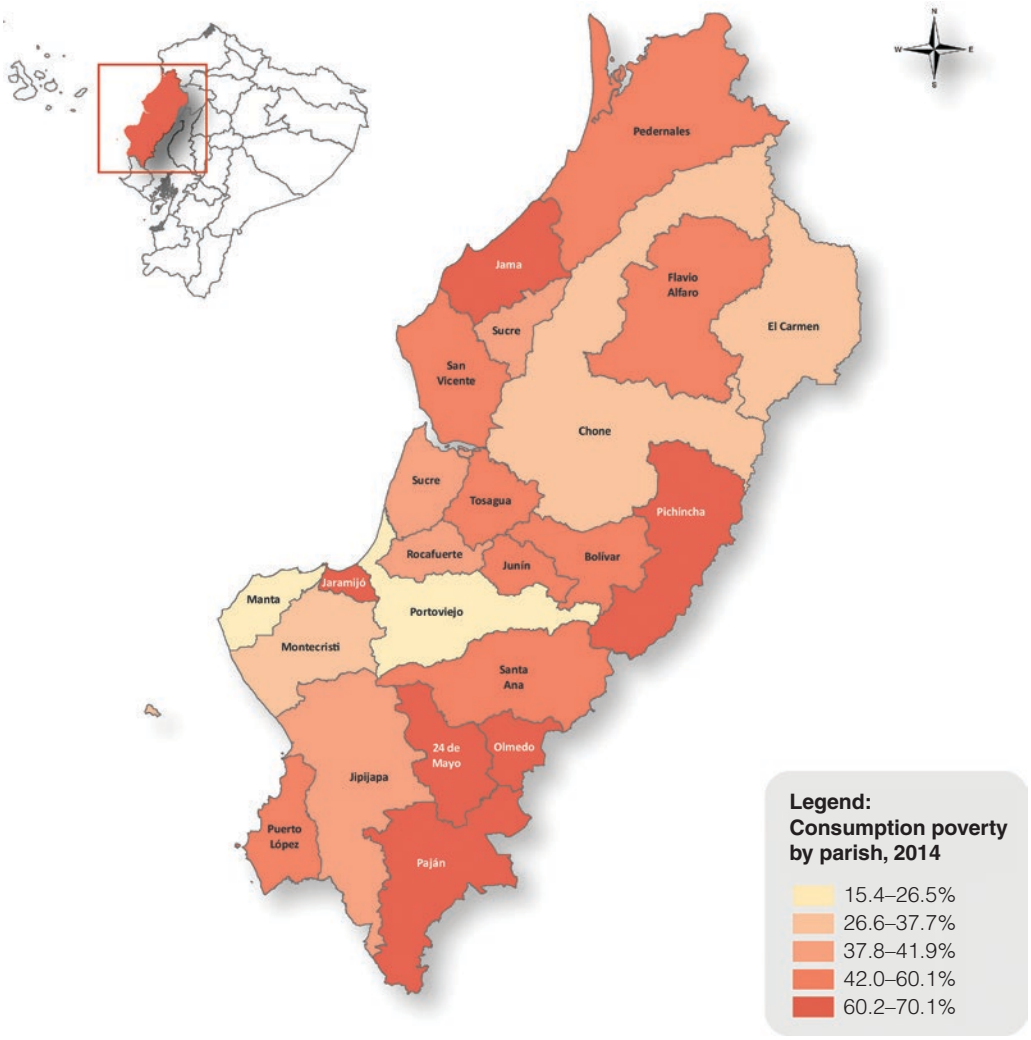


Source: World Bank, using ENEMDU 2010, 2014, and CPV 2010.

The parishes with higher poverty incidence (57–96 percent) at the national level are concentrated in the northwest zone of the country (Esmeraldas, Imbabura, and Carchi); the central zone (Cotopaxi and Chimborazo), and the Amazonia (Napo, Pastaza, and Morona Santiago).

Even in provinces with a smaller poverty incidence there are important differences at the parish level. For example, map 2.2 depicts the poverty map in the province of Manabí, which has a province-level poverty incidence of 31 percent. However, this is a very heterogeneous province, as there are parishes where the poverty incidence is below 20 percent, some where poverty is closer to the province average, and others in which it reaches 90 percent. Moreover, the estimated Gini coefficient in Manabí is higher than the average province-level Gini coefficient (0.3715 and 0.3396, respectively), surpassing provinces such as Carchi, El Oro, Esmeraldas, Loja, Santa Elena, Santo Domingo, Tungurahua, and Zamora Chinchipe.

Map 2.2: Poverty Map for Manabí Province



Source: INEC 2016.

Notes

1. The 2014 Poverty Assessment includes consumption-based poverty maps at the most disaggregated political division level (parroquia, or parish), elaborated using small-area estimation techniques. The analysis was based on the Population and Housing Census 2010 (Censo de Población y Vivienda, CPV10) and the Living Conditions Survey 2014 (Encuesta de Condiciones de Vida, or ECV). According to Elbers, Lanjouw and Lanjouw (2003), the small-area estimation is used to calculate consumption-based poverty as well as inequality indicators at geographic levels that are more disaggregated than those in the ECV. The ECV is the instrument used to measure consumption-based poverty. It is conducted about every five years and is provincially representative.
2. The national poverty lines (in monthly per capita terms) for 2014 were about US$48 for extreme poverty and US$84 for general poverty. These figures translate into US$1.60 and US$2.80 per day, respectively.
3. From here on, the analysis refers to consumption-based poverty.
4. Ecuador is divided into provinces, cantons (i.e., municipalities), and parishes (the smallest government level).

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Chapter 3
Water Supply, Sanitation, and Poverty: Positive Trends and Systemic Barriers in Access for the Poor

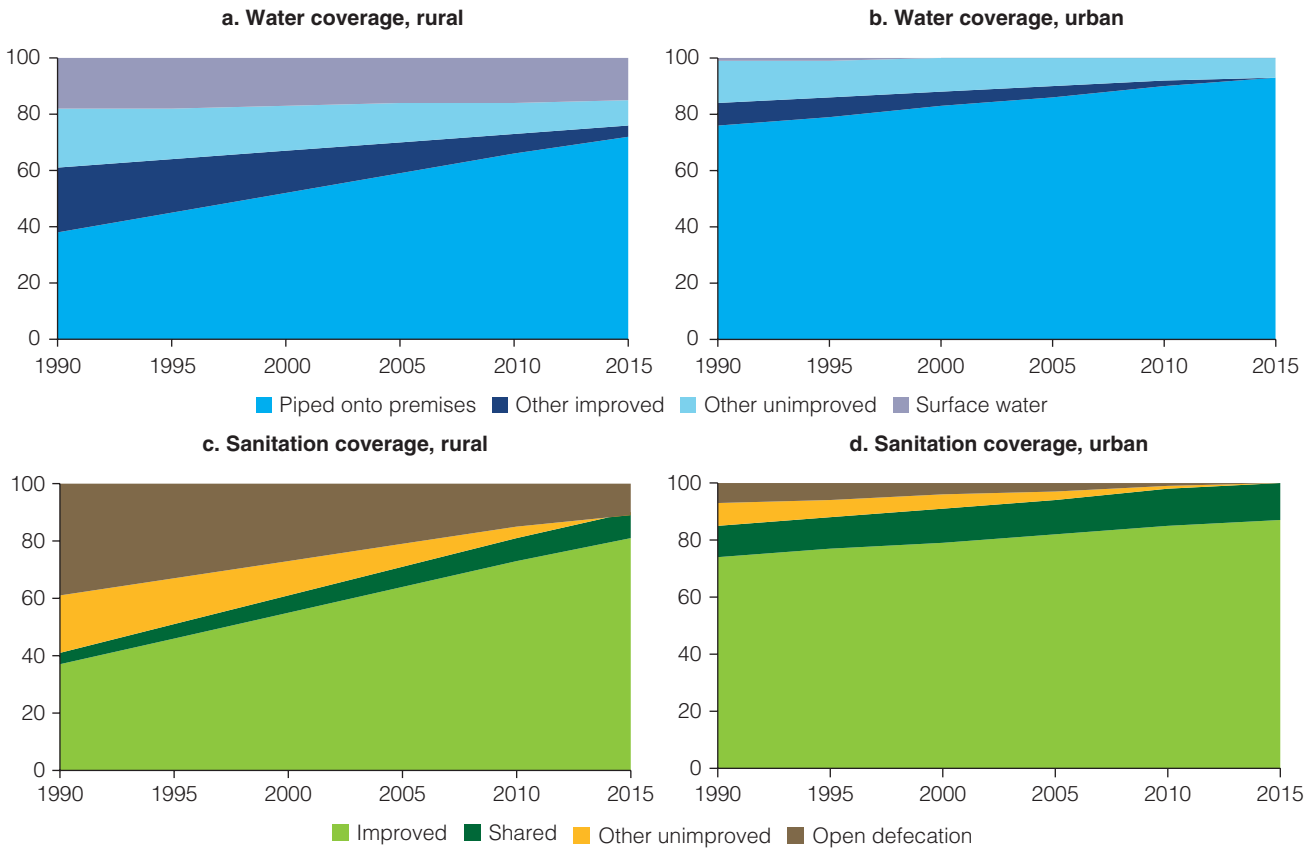
National Trends Show a Long-Term Improvement in Water and Sanitation Coverage

For a long time, Ecuador has been consistently improving water and sanitation coverage for its population. According to the JMP coverage estimations, Ecuador has been steadily improving both water and sanitation coverage since 1990.[1] Indeed, between 1990 and 2015, access to improved water (i.e., piped water or other improved water) increased by 13 percentage points, reaching 87 percent of the population, and improved sanitation increased by 28 percentage points, reaching 85 percent of the population. Among countries monitored by the JMP, this places Ecuador in the eighth and fifth places with respect to progress made to increase coverage in water and sanitation, respectively. Access to improved water is still below the Latin American average of 95 percent, whereas access to improved sanitation is above the average of the region of 83 percent (WHO-UNICEF JMP 2015).

In particular, the progress in rural areas is notable. The coverage of improved water in rural areas increased by 15 percentage points over the period, while the coverage of improved sanitation increased by 44 percentage points, a much larger increase than at the national level. As figure 3.1 shows, improved coverage in urban areas was already high in the early 1990s, in contrast to improved coverage in rural areas. As a result, rural areas have made significant progress in converging with the high rates of improved coverage in urban areas, although gaps remain.[2]

Interestingly, long-term trends of coverage expansion in water and in sanitation, in rural and in urban areas, did not accelerate in the last decade. Despite the government's increased attention to policies that expand access to improved water and sanitation, the long-term positive trend of coverage actually slowed slightly in the last decade. For example, improved water in rural areas expanded at a five-year rate of 4.9 percent between 1990 and 1995 (or 1 percent per year), and this rate slowly fell to 4.1 percent between 2010 and 2015 (or 0.8 percent per year). In urban areas, over the same period, the rate of expansion of access to improved water fell from 2.4 percent in 1990–95 to 1.1 percent in 2010–15. In sanitation, improved coverage in rural areas advanced at 24.3 percent between 1990 and 1995, versus 11 percent between 2010 and 2015, and in urban areas this expansion rate fell from 4.1 percent to 2.4 percent over the same periods. This slowdown also reflects the increasing marginal cost of closing gaps as coverage levels increase, as those who are not covered are typically households in remote areas or households that face other barriers of access. It also reflects the fact that urban areas expanded over the period, which means that urban areas today have larger peri-urban settlements (with lower improved coverage) whereas rural areas tend to be more isolated and harder to reach.[3]

Figure 3.1: Water and Sanitation Coverage, 1990–2015



Source: WHO-UNICEF JMP 2015a.

Barriers of Access to Improved Water and Sanitation Persist for Certain Socioeconomic Groups

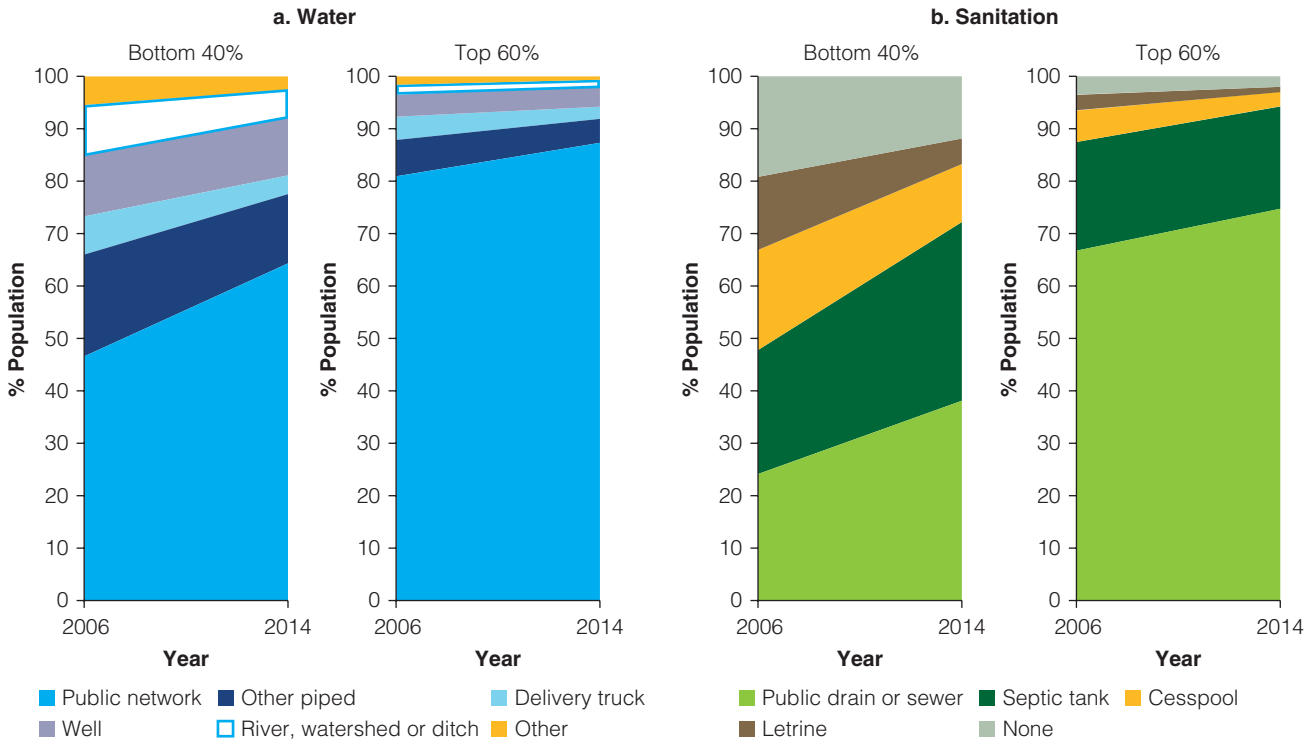
To understand the progress in improved coverage for different groups of the population, the following analysis relies on the last two Living Conditions Surveys (ECV) from 2006 and 2014. These are the same data sources used in the measurement of consumption-based poverty mentioned in chapter 1. The analysis explores the improvements in improved water and sanitation coverage between 2006 and 2014 over the income distribution, and by population dimensions such as location and ethnicity.

Data availability constraints and considerations of comparison among data sources limit the possible definitions of "improved" access. Standard household surveys in Ecuador do not collect sufficient information to distinguish between "improved" and "unimproved" access (as defined by the JMP) without making a few assumptions. Consequently, to maximize the possibility of comparing indicators over time and across data sources, the analysis uses the following definitions in figure 3.2 and table 3.1:

- **Improved water**: in both urban and rural areas, delivery from the public network (red pública) or other piped (otra por tubería)

- **Improved sanitation**: in urban areas, toilet and sewerage (sanitario y alcantarillado) and in rural areas, either toilet and sewerage OR septic tank (pozo séptico)[4]

Figure 3.2: Access to Improved Coverage in 2014 for the Bottom 40 Percent Is Lower than Access to Improved Coverage for the Top 60 Percent in 2006



Source: Based on data from ECV 2006 and 2014.

Table 3.1: Access to Improved Coverage in 2014 for the Bottom 40 Percent Is Lower than Access to Improved Coverage for the Top 60 Percent in 2006

	Bottom 40%		Top 60%	
	2006	2014	2006	2014
Water				
Public network*	46.6	64.1	80.9	87.1
Other piped*	19.4	13.3	7	4.8
Tanker truck	7.3	3.8	4.4	2.5
Well	11.7	10.8	4.2	4
River, source	9.3	5.2	1.8	1
Other	5.7	2.7	1.7	0.7
(*) Improved	66	77.4	87.9	91.9
Sanitation				
Sewerage and toilet*	24.2	37.9	66.6	74.3
Septic tank*	23.4	33.9	20.6	19.6
Cesspool	19.2	11.2	6.2	2.8
Latrine	13.7	4.7	2.9	0.9
None	19.5	12.3	3.8	2.3
(*) Improved (rural: septic tank)	35.5	58.2	74.1	83

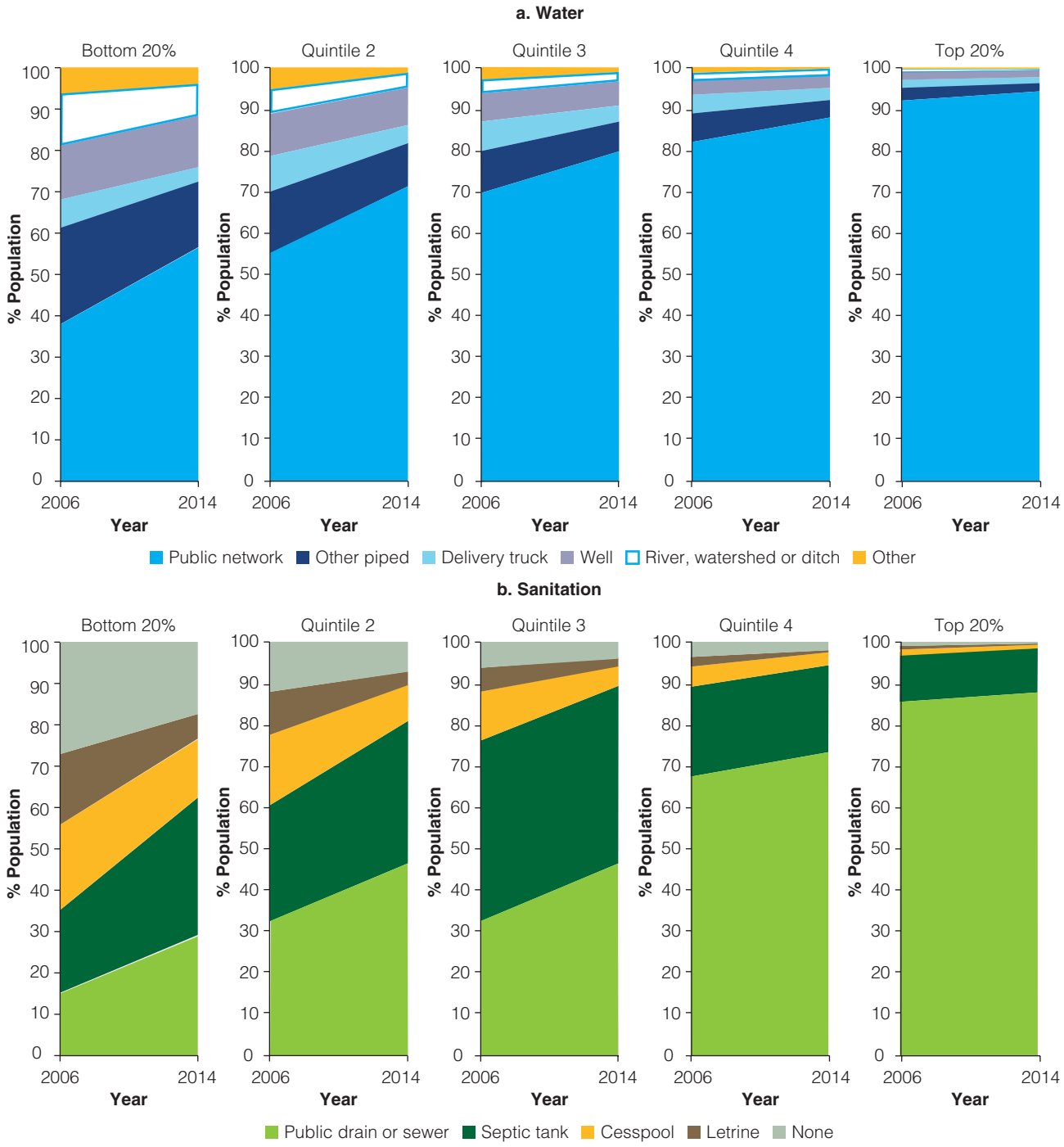
ECV indicators show that although there was progress in rural areas, Guayaquil and other urban areas also significantly expanded the rate of improved coverage.[5] Between 2006 and 2014, access to improved water expanded nationally, reaching 94.5 percent in urban and 67.7 percent in rural areas in 2014. Likewise, access to improved sanitation facilities also expanded significantly, to 77 percent in urban areas and to 64.8 percent in rural areas. However, Quito and Guayaquil's high coverage rates bias somewhat the urban average. Without taking these cities into consideration, urban areas' improved water coverage is 85 percent and their improved sanitation coverage is 70 percent. Septic tank solutions in smaller urban areas and in rural areas have significantly helped expand improved sanitation, more than sewerage expansion. In rural areas, expansion of improved coverage was significant, but not sufficiently to close gaps. Improved water, for instance, increased by 6 percentage points in rural areas, while in urban areas (without Quito and Guayaquil) it increased by 7 percentage points and in Guayaquil by more than 10 percentage points. Improved sanitation increased by 23.3 percentage points in rural areas, against 23.7 percentage points in Guayaquil, and 7 percentage points in the rest of urban areas. Guayaquil experienced an aggressive expansion of piped water and sewerage connections over the period.

Whereas progress in access to improved water and sanitation for the bottom 40 percent has been significant, the gap with the top 60 percent has been only slightly reduced. According to figure 3.2, improved water and sanitation coverage of the bottom 40 percent and the top 60 percent increased significantly from 2006 to 2014. Moreover, improved water coverage increased by 10 percentage points (66 to 77.4 percent) for the bottom 40, against 4 percentage points for the top 60 (87.9 to 91.9 percent). Still, improved coverage for the bottom 40 percent lags almost 15 percentage points below the top 60 percent. A somewhat similar situation can be observed with respect to improved sanitation coverage of the bottom 40 percent, which has improved faster than for the top 60 percent, but where a gap of 25 percentage points remains between the two groups.

This story is confirmed when analyzing water and sanitation coverage by quintiles (figure 3.3). Access to improved water has dramatically increased in quintiles 1 and 2 (the bottom 40 percent), while access by delivery truck and from surface water fell significantly (access by well decreased slightly). Interestingly, access through community providers ("other improved") fell, most likely due to increased urbanization. Access in quintiles 3, 4, and 5 also progressed, though from a higher level. Still, improved coverage through the public network in quintile 3 in 2014 was below the coverage in quintile 4 in 2006, which suggests slower progress among the vulnerable segments. Although the gap between the richest and poorest quintiles has narrowed, it remains large. For example, improved water coverage in quintile 1 (the poorest) was 73 percent in 2014, but in quintile 5 (the richest) it was 97 percent, a 25 percentage-point difference.

In sanitation, the expansion of septic tank solutions—more than of sewerage—has driven the increase in improved sanitation in the bottom three quintiles. Septic tank solutions explain the majority of improved sanitation increases for the bottom 40 percent of the population. In 2014, only 29 percent in the poorest quintile and 47 percent in the second quintile were connected to sewerage, while in the third quintile 61.5 percent had a connection, compared with 88 percent in the richest quintile (figure 3.3 and table 3.2). Moreover, as with improved water, the coverage of sewerage in the third quintile was lower in 2014 than it was in the fourth quintile in 2006. In contrast, septic tank solutions improved more significantly for quintiles 1 to 3, which made a greater contribution to raising the rate of improved coverage than did sewerage, though not enough to close the socioeconomic gap. Indeed, the gap between the richest and poorest quintiles is even wider for improved sanitation than in water coverage: whereas 51 percent of the poorest quintile had improved sanitation coverage in 2014, 92 percent of the richest quintile benefited from it (a 40 percentage-point difference). Among urban areas, improved sanitation increases were highest in Guayaquil, reaching about 78 percent in 2014. However, unimproved sanitation remains high in secondary cities.

Figure 3.3: Improved Coverage Is Highly Correlated with Income



Ethnic population groups saw much progress in closing the improved water coverage gap, but less progress for improved sanitation. Improved water coverage expanded significantly among Afro-Ecuadorans (11.6 percentage points), bringing it to the same level as for indigenous groups, at about 83 percent in 2014. At the same time, among the mestizo (mixed-race) group, which is mostly urban, coverage increased by 9.7 percentage points—still 7 percentage points higher than for the other two major ethnic groups (table 3.3). In contrast, improved sanitation coverage increased evenly for the three major groups (by

Table 3.2: Improved Coverage by Quintile, 2006 and 2014

	Bottom 20%		Quintile 2		Quintile 3		Quintile 4		Top 20%	
WATER	2006	2014	2006	2014	2006	2014	2006	2014	2006	2014
Public network*	37.8	56.7	55.3	71.4	69.3	79.8	82.1	87.9	92.2	94.4
Other piped*	23.6	15.9	15.2	10.7	10.6	7.4	7	4.6	3.4	2.3
Tanker truck	6.4	3.5	8.3	4.1	6.8	3.5	4.4	2.5	1.7	1.1
Well	13.3	12.4	10	9.3	6.8	6.3	3.9	3.6	1.8	1.8
River, source	12.5	7.7	6.1	2.8	3.6	1.8	1.3	1	0.5	0.2
Other	6.4	3.8	5	1.7	2.9	1.2	1.3	0.4	0.4	0.2
(*) **Improved**	**61.5**	**72.7**	**70.5**	**82.1**	**79.9**	**87.3**	**89.1**	**92.5**	**95.6**	**96.7**
	Bottom 20%		Quintile 2		Quintile 3		Quintile 4		Top 20%	
SANITATION	2006	2014	2006	2014	2006	2014	2006	2014	2006	2014
Sewerage and toilet*	15.2	28.9	33.1	46.9	47.8	61.5	67.5	74.7	85.6	88.1
Septic tank*	19.6	3.6	27.3	34.3	28.7	28.2	21.8	20.1	11.1	10.2
Cesspool	20.8	14.4	17.6	8	11.7	4.4	4.9	2.9	1.8	1
Latrine	17.1	6	10.4	3.3	5.8	1.9	2.1	0.6	0.7	0.2
None	27.3	17.1	11.7	7.4	6.1	4	3.8	1.7	0.8	0.4
(*) **Improved (rural: septic tank)**	**25.5**	**51.2**	**45.6**	**65.1**	**59.1**	**75.1**	**75.5**	**83.2**	**89.2**	**92.1**

Source: Based on data from ECV 2006 and 2014.

Table 3.3: Indigenous Groups Have (Almost) Closed the Gap in Improved Water, But Not in Sanitation

	Indigenous		Afro-Ecuadoran		Mixed	
WATER	2006	2014	2006	2014	2006	2014
Public network*	41.5	57.5	65.4	75.5	69.3	82.5
Other piped*	39	25.4	5.4	6.9	10.2	6.7
Tanker truck	0.9	1.3	7.3	5.6	5.9	2.7
Well	4.1	3.3	7.9	6.1	7.3	5.2
River, source	11.2	8.5	8.6	3.7	4.1	1.8
Other	3.3	4	5.4	2.2	3.2	1.2
(*)Improved	80.5	82.9	70.8	82.4	79.5	89.2
	Indigenous		Afro-Ecuadoran		Mixed	
SANITATION	2006	2014	2006	2014	2006	2014
Sewerage and toilet*	25.5	33	40.5	56	52	65.8
Septic tank*	17	26.6	21.2	26.3	22.3	23.5
Cesspool	15.6	13.8	15	7.2	10.8	4.7
Latrine	10.4	3.8	10.4	2.6	6.7	1.7
None	31.5	22.8	12.9	7.9	8.2	4.3
(*)Improved (rural: septic tank)	39.2	56.2	47.3	64.7	61	77.4

Source: Based on data from ECV 2006 and 2014.

about 17 percentage points, mainly thanks to septic tank solutions). However, this means that the 2006 gaps did not close, in particular between indigenous groups and Afro-Ecuadorans (8.5 percentage points) and between indigenous and mestizo groups (21 percentage points). This is also related to the fact that improved sanitation (in contrast to improved water) is much more difficult to expand in rural areas, where most Indigenous groups live.

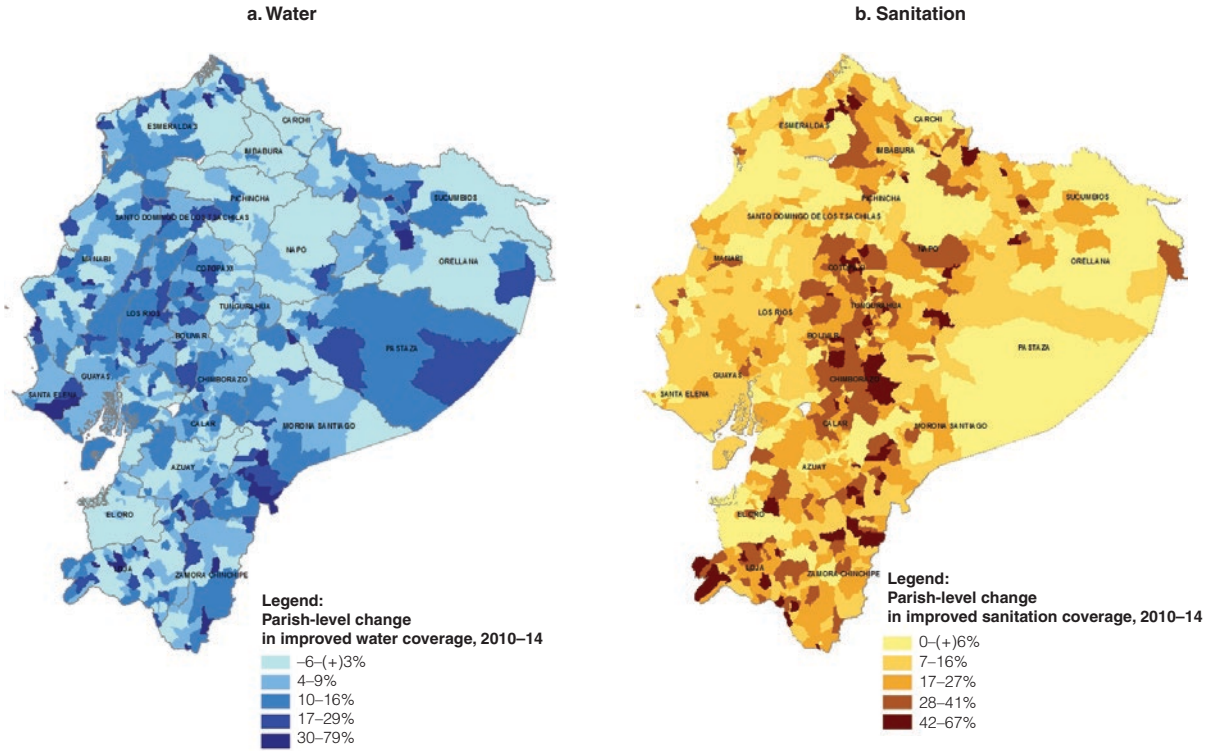
Finally, a regression analysis of improved coverage against location and socioeconomic characteristics of the household reveals that both location and poverty are strong predictors of access. To understand how strong the correlation is between improved coverage and household characteristics, a regression is estimated that includes the household's consumption quintile, dependency ratio, overcrowding; geographic location (urban or rural, natural regions); household head characteristics (ethnicity, age, education, civil status, social security); and dwelling quality (access to electricity, and quality of roof, walls, and floor). The estimates show that for improved water, three groups—urban households, those in the Sierra region, and those with better dwelling characteristics and access to electricity—are more likely to have coverage; as are households whose head is older, more educated, belongs to the second quintile or higher, or is indigenous. In contrast, for improved sanitation, rural households, those in the Sierra region, and those with better dwelling characteristics and access to electricity are more likely to have coverage; and households whose head is older, more educated, married, has access to social security, and has more income are also more likely to have coverage, whereas household with indigenous heads are less likely to have coverage. These differences suggest that for sanitation, septic tanks have made a real difference in rural areas, so that, keeping all other characteristics constant, rural households are more likely to get better sanitation coverage than urban ones. At the same time, indigenous households are particularly disadvantaged, as they have a much lower probability of access despite the fact that they are mostly located in rural areas.

Barriers of Coverage at the Microregional Level

Next, the evolution of improved coverage is analyzed at the most disaggregated geographical level. Using data from the Population Census (CPV 2010), and the Social Registry (RS 2014, a database used for targeting social safety net programs), which collect information on WSS access at the household level, we apply the same definitions of improved water and sanitation coverage to look at how it changed at the parish level between 2010 and 2014.[6] These data sources provide a more refined picture at the local level, highlighting exactly where the gaps in improved WSS coverage persist (within provinces and cantons). This information can be helpful in improving investment targeting and planning, given that the delivery of WSS is decentralized at the canton level. Therefore, identifying the gaps at the geographic level is crucial to determine in which cantons service delivery capacity is still weak. Following are the main results, using the same definitions of improved water and improved sanitation as in the previous analysis.

Mapping coverage at the parish level shows there is considerable geographic heterogeneity. Between 2010 and 2014, there were larger increases in improved water coverage along the Amazon and Coast regions, and there was a higher increase in improved sanitation in the Sierra parishes (map 3.1). Although there is no clear pattern in improvement between urban and rural parishes, it seems that the largest improvements occurred in a few provinces such as Pastaza and Los Ríos, whereas other provinces with historically large deficits, particularly in Esmeraldas and Manabí, did not see similar increases. Yet, the increases in Guayas are impressive. It is interesting to note that increases in sanitation coverage are much more highly localized along the Sierra region, in particular in central Sierra provinces, whereas the rest of the country improved at a less significant magnitude.[7]

Map 3.1: Increases in Improved Water Coverage Are Less Localized than Increases in Improved Sanitation, 2010–14



Source: Elaborated by the World Bank and INEC, drawing on the CPV 2010 and the Social Registry 2014.

Poor Parishes Are Still More Likely to Have Lower Coverage

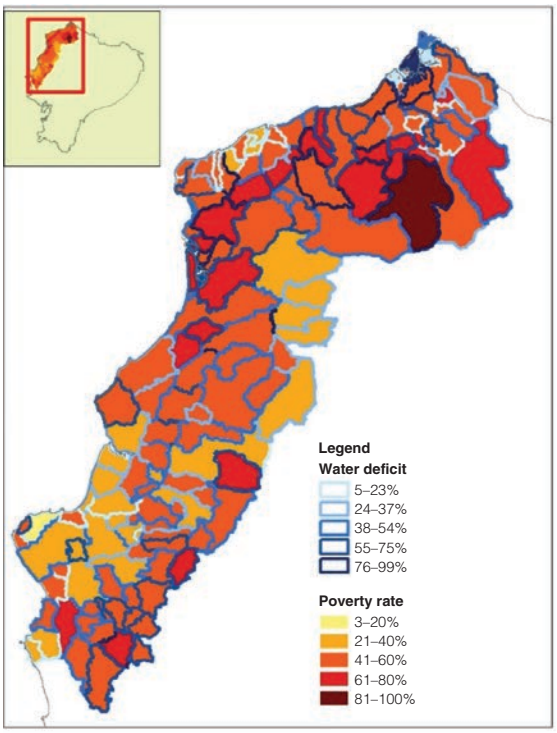
To understand the relationship between coverage and poverty at the parish level, income poverty maps were estimated for 2010 and 2014, and combined with the coverage maps. Overall, these confirm the previous findings from survey data, showing a correlation between the gaps in coverage and the poverty levels at the parish level (map 3.2). Taking three Coastal provinces to zoom in on parish-level poverty and coverage, the correlation between poverty and deficit becomes clear, both for water and for sanitation. For instance, in Esmeraldas and Manabí, the poorest parishes are also the ones with the highest deficits (although there are a few exceptions in sanitation). In provinces such as Guayas the picture is more mixed. Some parishes have relatively lower poverty and yet have high deficits, and some poorer parishes show low deficits; the same pattern occurs with sanitation.

Access to "Safe" Water Supply and Sanitation Remains an Important Challenge

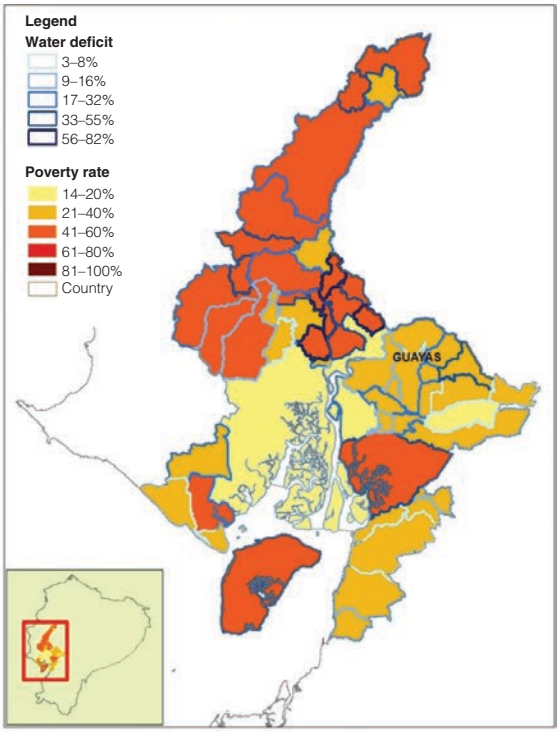
Despite Ecuador's progress in expanding coverage to reach the MDG targets for WSS, there is not enough information to understand whether improved access implies "safe" access. In this regard, SDG 6, "Ensure access to water and sanitation for all," has raised the bar by specifying complementary "improved" access definitions that include quality and service delivery aspects

Map 3.2: Parish-Level Poverty vs. Water and Sanitation Coverage Deficits in Esmeraldas, Manabí, and Guayas, 2014

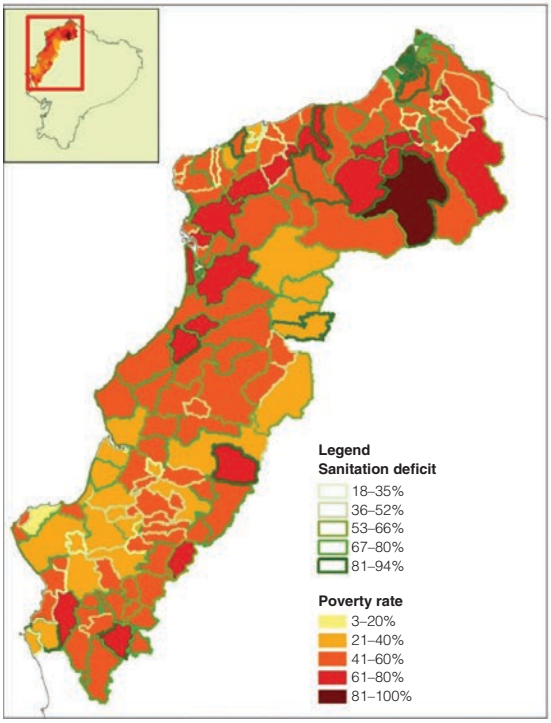
a. Esmeraldas and Manabí, water



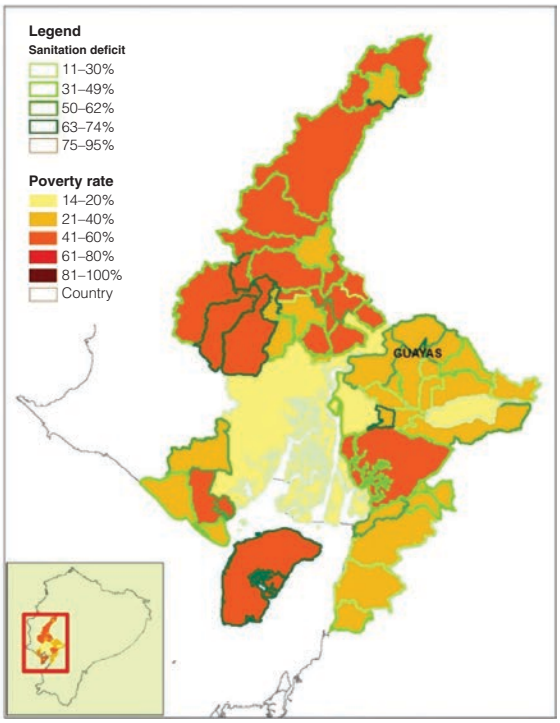
b. Guayas, water



c. Esmeraldas and Manabí, sanitation



d. Guayas, sanitation



Source: Elaborated by the World Bank and INEC, drawing on the CPV 2010 and the Social Registry 2014.

that correspond better to the definition of safe water and safe sanitation. The definitions are as follows:

- ***Safe Water***: Percentage of the population using safely managed drinking water services, which implies that households use "improved" water services that are at most 30 minutes away (round trip), available in the necessary quantities, and free of fecal contamination (water quality).

- ***Safe Sanitation***: Percentage of the population using safely managed sanitation services, including a handwashing facility with soap and water (hygiene). This implies that households use "improved" sanitation services that are not shared with other households, and feces are safely managed in situ or treated by a third party.

Measurement instruments currently available in Ecuador are not ideal for monitoring and reporting on SDG 6. To determine the adequacy of the surveys that capture WSS indicators for both the MDGs and the SDGs, 23 surveys were reviewed. The conclusion: limitations exist for MDG monitoring that similarly complicate SDG monitoring.[8] The new measure of safe WSS includes indicators of the quality and continuity of water and sanitation coverage that are not usually captured in the surveys. These additional aspects pose a significant challenge for the institutions charged with measuring and monitoring these indicators (box 3.1).

In light of these new challenges, Ecuador's statistical office, INEC, partnered with the World Bank and UNICEF to implement a pilot survey to measure SDG 6. Taking the most frequently used survey, the ENEMDU (National Survey of Employment, Unemployment and Underemployment), as the preferred instrument for monitoring SDGs, a number of modifications and additional questions were tested in the September 2016 round and mainstreamed in the December 2016 round. The changes were designed to produce sufficient information for monitoring and reporting on progress toward the SDGs without sacrificing comparability with past round of this

Box 3.1: From MDGs to SDGs in WSS

Under the MDGs, countries were requested to report the coverage of water and sanitation, distinguishing between "improved" and "unimproved" coverage. The WHO-UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) established specific indicators for each, using definitions that could be captured with information from standard household surveys, which typically rely on self-reported questions on access to services collected from a nationally representative sample of households. While most countries have household-level surveys with questions on water and sanitation, there is tremendous heterogeneity in the quality of the information obtained. Consequently, the JMP has had to develop a number of tools to harmonize data and build comparable indicators.

SDG 6, "Ensure access to water and sanitation for all," seeks to reduce the incidence of malnutrition, communicable diseases, and inequities that are directly related to lack of access to improved sources of drinking water and sanitation. The adoption of this new goal adds a layer of complexity: while it implies a commitment by the country to monitor and report on its progress—similarly to what was done for the MDGs—the new indicators are more refined and stricter than the MDG indicators.

box continues next page

Box 3.1: Continued

To build these SDG 6 indicators, countries need to go beyond self-reported questions. In fact, the new definition of safely managed drinking water requires conducting a water quality test of the source from which the household gets its drinking water; while the inclusion of handwashing facility with soap and water requires conducting eyewitness accounts of the place where household members wash their hands.

There is awareness that current measurement instruments are not ideal for monitoring and reporting on progress toward SDG 6. A review under the JMP shows that significant limitations in Ecuador data impeded MDG monitoring and will similarly impede SDG monitoring unless the questionnaires are adjusted. In 2016 INEC, with support from the World Bank and UNICEF, embarked on a project to pilot the measurement of an SDG6 baseline.

Source: Oviedo and Loughnan 2016, http://www.mdgfund.org/node/519.

survey. They include integrating new sources along with household survey data; checking for evidence of progressive reduction of inequity; and monitoring not just at the population level but in institutional settings. Additional elements on expenditure and affordability are also being developed to be included in SDG monitoring and beyond.

A Pilot to Measure the Baseline for SDG 6 Monitoring and Reporting

A new module containing SDG-compliant WSS questions was developed and tested in partnership between INEC, UNICEF (JMP), and the World Bank to produce new data to build an SDG baseline for WSS.[9] The module was based on a conceptual and methodological framework for producing official SDG indicators in the WSS sector. According to the additional measures under SDG 6, a drinking-water source is considered safely managed if it (i) can be classified as improved according to the MDG definitions; (ii) is free of fecal contamination (as shown by tests; see in photos 3.1 and 3.2); (iii) takes less than 30 minutes for the household to fetch the water; and (iv) is available when needed (continuity). Likewise, sanitation facilities are considered *safely* managed if (i) they can be classified as improved; (ii) they are not public or shared with other household(s); and (iii) fecal waste is properly transported away from the household.

The results of the 2016 pilot survey and the December round of the ENEMDU confirm that improved access to WSS as defined for the MDGs does not reflect the situation of access to safe WSS as defined by the SDGs. At the national level, access to safe water dropped to 72.5 percent, and access to safe sanitation fell to 25.1 percent (figure 3.4).[10] More specifically, improved coverage is 93 percent in urban areas and 76 percent in rural areas for water, and 87 percent in urban areas and almost 86 percent in rural areas for sanitation; whereas access to safe water is 79.1 percent in urban areas and 51.4 percent in rural areas.

Moreover, fecal contamination of water is an issue. The new measures indicate that 20.7 percent of the population drinks contaminated water (thus, 79.3 percent consume water free of fecal contamination). While 15.4 percent of the water in urban households is contaminated (of which almost 29 percent is bottled water), in rural households the share is

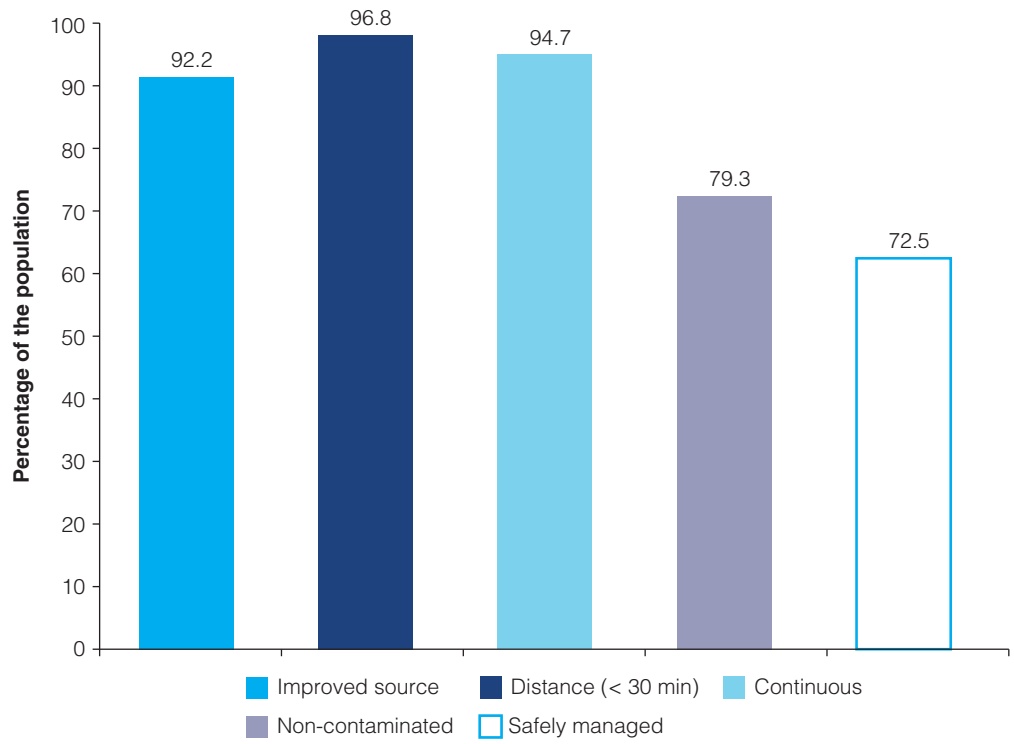
Photo 3.1: Enumerator Taking a Water Sample for *E.coli* Presence Test

Source: Ana Maria Oviedo.

Photo 3.2: Incubator Holding Water Samples for Testing

Source: Libbet Loughnan

Figure 3.4: Access to Safely Managed Water, National, 2016



Source: INEC, December 2016.

31.8 percent, of which 20 percent comes from local community providers (Juntas Administradoras de Agua Potable, or JAAPs) and 12 percent from protected wells. This variation in quality by source is one of the reasons that access to safe water is lower. By contrast, other components of safely managed water are strong: at the national level, almost 97 percent of households live less than 30 minutes from their water source (round trip), while 94.7 percent have continuous service.

In summary, the progress observed in the last 10 years in coverage of WSS tells only part of the story. As this chapter shows, greater attention to the WSS sector did not necessarily accelerate progress in coverage or address the areas with the largest coverage gaps, although it certainly helped to reduce or eliminate coverage gaps in certain (mostly urban) areas. Still, some population groups, especially in rural areas on the Coast and in the Amazonia regions, show persistent low coverage in water and especially in sanitation. Interestingly, although indigenous communities have seen a significant increase in improved access to water, they still lag behind in rates of improved access to sanitation. But more important, the analysis in the chapter shows that improved coverage measurements in the country hide worrisome deficiencies in terms of access to "safe" water. Indeed, new measurements consistent with SDG 6 reporting requirements show that a large proportion of piped water provision is neither continuous nor safe to drink, especially in rural areas.

Notes

1. The JMP collects harmonized indicators of coverage for water and sanitation using available census and survey data worldwide. When it is not possible to directly measure these indicators, they are estimated indirectly.

2. JMP data are estimates based on data from different sources up until 2012. However, they are somewhat imprecise. For instance, the use of surface water in 2006 from ECV is consistent with the JMP data, but the 2015 estimate is much higher than the actual 2014 ECV number (which was not included in the JMP analysis), which is 8.4 percent in rural areas. Overall, the numbers show a much more important decline in surface water use than estimated by the JMP.
3. A study by CEPAL (2014) shows that the marginal cost of a new water connection at 2011 prices went up from US$2,000 (in the range of 80–90 percent coverage between 2003 and 2007) to US$3,935 (in the same range of coverage between 2008 and 2012). In sanitation, the figures for an additional improved sanitation connection went up from US$1,621 in the 70–79 percent range (between 2003 and 2007) to US$3,188 in the 80–89 percent range of coverage (between 2008 and 2012).
4. These definitions correspond to the official definitions used in the country, for instance, in the National Water and Sanitation Strategy (ENAS) and in the PNVB. This definition allows for the use of data sources such as the Housing and Population Census (Censo de Población y Vivienda, CPV) 2010 and the Social Registry 2014. The Social Registry contains information on access to water service as well as on the type of access to sanitation that households had in 2014.
5. At the national level, the ECV indicators show lower numbers than the JMP estimates (as a result of the stricter definition used in Ecuador). Hence, the national coverage for improved water was 86.2 percent in 2014 and for improved sanitation was 73.2 percent.
6. The RS (2014) does not have full national coverage in a way similar to the CPV (2010). Therefore, we needed to impute coverage values at the parish level when less than 100 percent of households are surveyed. For this, we applied an imputation method, taking values from the CPV 2010 when a parish had less than an established threshold of coverage. The methodology is detailed in the background note by Acosta (2016). As a result, coverage increases in certain parishes, especially non-poor and urban, are underestimated, although most of these cases already had close to universal coverage in 2010.
7. Although the greatest increases in water coverage have been in some parts of the Amazon and the eastern coastal region, the largest deficits remain in these regions. There have been improvements of at least 10 percentage points in general at the parish level, and the fact that some areas do not show noticeable improvements is explained mainly by their initial high levels of coverage.
8. These surveys are the ENSANUT12, CPV10, ECV06, EDSM04, WHS03, CEN01, END99, ECV98, ECV95, END94, CEN90, EDSM89, DHS87; plus ENEMDU 2015, ENEMDU 2014, ENEMDU 2010, ENEMDU 2009, ENEMDU 2008, ECV 2013–14, Social Registry 2013–14, ENSANUT 2011–13, ENIGHUR 2011–12, and ENDEMAIN 2004.
9. This subsection draws heavily on Castillo (2016).
10. According to the new SDG definition, safe sanitation includes "safely managed" wastewater. Data are not available from household survey data for users connected to sewerage but are available for those that have septic tank solutions. In the absence of such information for households connected to sewerage, INEC decided to classify them as "basic" rather than "safe," thus dramatically changing the picture for sanitation. Indeed, under this new definition the coverage of "safe" sanitation is higher in rural areas, where septic tank solutions are more prevalent. As these data create a baseline, it is possible that as INEC collects more data on wastewater management these differences will be greatly reduced.

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Chapter 4
Water Supply, Sanitation, and Human Development: Exploring the Linkages and Synergies with Health and Nutrition

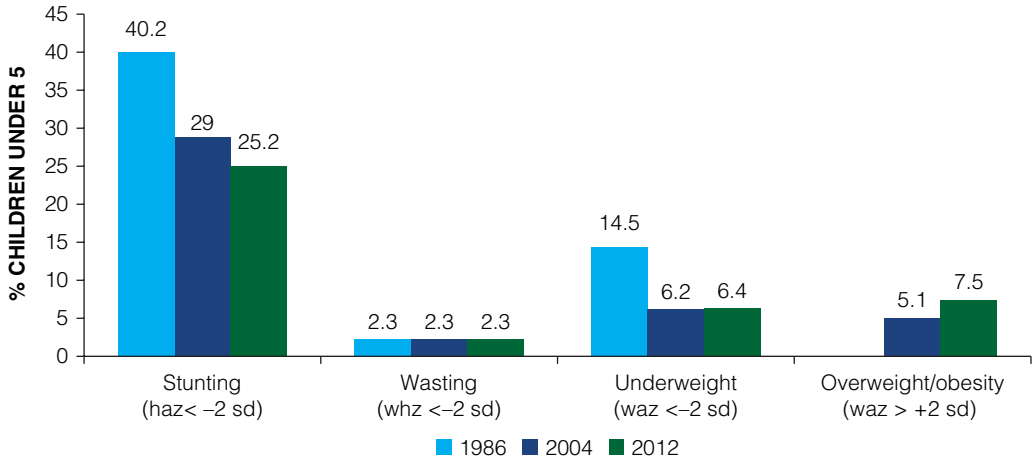
While monetary (and non-monetary) poverty indicators show tremendous progress in Ecuador over the last 10 years, human development indicators, in particular for children, have been more difficult to improve. For example, the under-five mortality rate in Ecuador has declined by more than 50 percent since 1990, from 57 deaths per 1,000 live births down to 22 deaths per 1,000 live births in 2015, yet is still above the average for Latin America and the Caribbean (18 deaths per 1000 live births). Moreover, undernutrition continues to be a major public health problem in Ecuador: 25.2 percent of under-five children are stunted (height-for-age z-score <−2), 2.3 percent are wasted (weight-for-height z-score <−2), and 6.4 percent are underweight (weight-for-age z-score <−2) (figure 4.1).

Whereas a significant improvement in these indicators occurred during the 1990s, there was little progress in the 2000s, in contrast to the rest of the region. As figure 4.2 shows, among a group of Latin American and Caribbean countries with comparable data periods, Ecuador now has the second highest stunting rate, after only Guatemala. Moreover, among this group, Ecuador and Guatemala are the countries with the smallest relative reduction in stunting. Ecuador has a stunting rate comparable to those of several sub-Saharan African countries (Botswana at 23 percent, Ghana at 26 percent, and South Africa at 23 percent) (World Bank 2007: xv–xvi). This result is striking in light of the period of high GDP growth that the country experienced between the early 2000s and 2014, and the substantial increase in government spending, in particular on infrastructure, health, education, and social assistance, which was intended to close gaps in human development outcomes, especially for the poor and for vulnerable children.

Common illnesses such as diarrhea, fever, and respiratory infections contribute to the rates of child malnutrition worldwide. According to the World Health Organization (2013), diarrheal disease is the second leading cause of death in children under five years old despite it being both preventable and treatable. In developing countries, diarrhea is more critical, considering that “children under three years old experience on average three episodes of diarrhea every year” (World Health Organization, 2013). As a result, diarrhea is one of the leading causes of malnutrition worldwide.

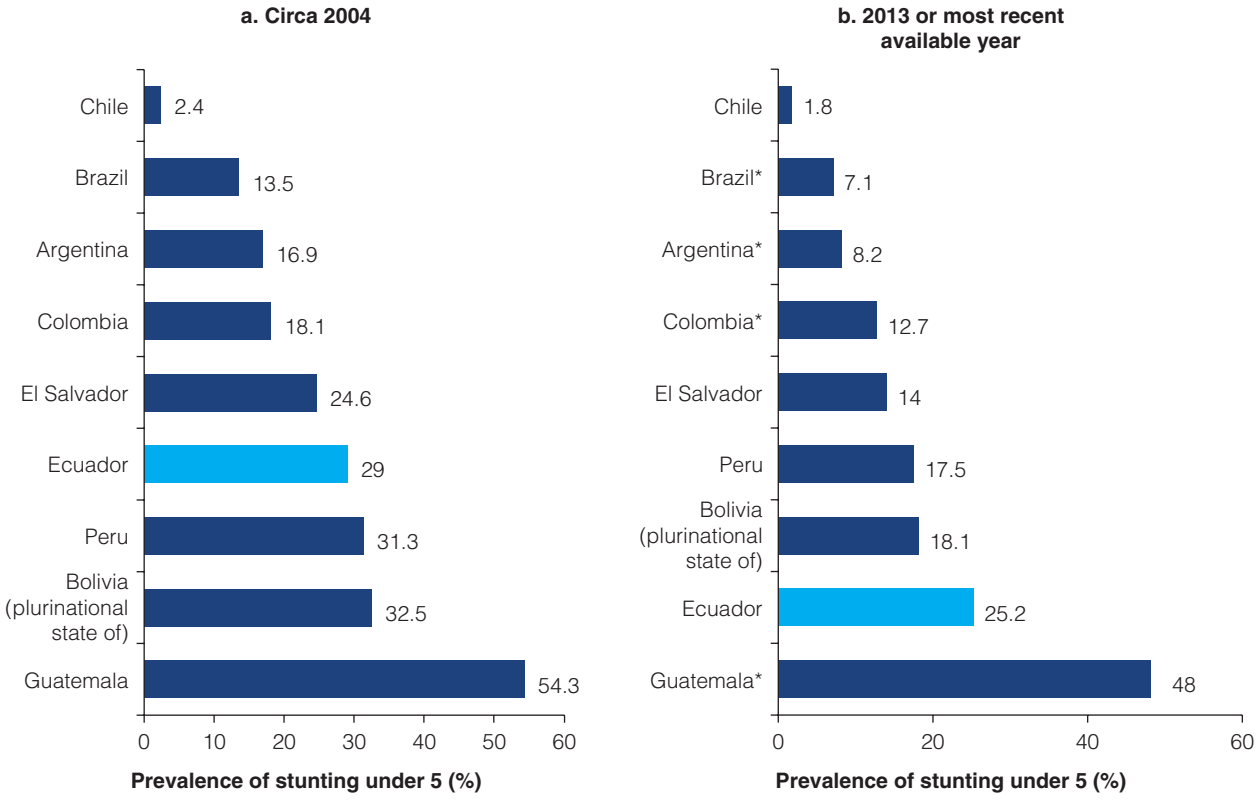
Poor access to WASH has been linked with certain factors of child mortality and undernutrition in Ecuador. According to the most recent Demographic and Health Survey (DHS) data, diarrhea is the third leading cause of death among children under five, behind pneumonia and injury, and it was estimated in 2013 that 4 percent of all under-five deaths in Ecuador were due to diarrheal disease. In addition, soil-transmitted helminth infection is endemic in some areas of Ecuador with some of these areas estimated to have a prevalence of infection with soil-transmitted helminth of more than 50 percent. Although there are few rigorous studies linking improved WASH access to these diseases, there is evidence of significant correlations among them.[1]

Figure 4.1: Nutritional Indicators Show Little Progress since 2004



Source: UNICEF, WHO, and World Bank Group 2015 joint dataset using UNICEF interactive dashboard. Accessed at http://www.data.unicef.org/resources/child-nutrition-interactive-dashboard-2015-edition.html.
Note: SD = standard deviation. HAZ = height for age z-score. WHZ = weight for height z-score. WAZ = weight for age z-score.

Figure 4.2: Other Latin American and Caribbean Countries Have Been More Successful in Reducing Stunting in Children under Five



Source: Joint Malnutrition dataset from UNICEF, WHO, and World Bank 2014. http://www.data.unicef.org/nutrition/malnutrition.html.
* Latest available year is before 2013.

For instance, diarrhea prevalence appears to be significantly higher in children who drink water of low quality than those who drink higher-quality water, as well as for children from families who practice open defecation near their dwellings than those who have any form of toilet or latrine. Other studies have found that drinking untreated water and not washing hands before eating were significant risk factors for *Entamoeba histolytica* infection in children.

The effects of WASH on human development depend on where a country stands in terms of gaps in WASH access and equity and in terms of population health indicators. As Ecuador is a middle-income country, one could assume that the situation is not critical. However, a more granular analysis, in particular for certain areas and population groups, shows that this is not necessarily the case.

This chapter summarizes three studies that link access to improved WASH and child development. First, the WASH-extended UNICEF Synergies Framework was adapted to Ecuador so as to understand the complementarities between WASH and the other nutrition dimensions; second, the Poverty Risk Model (PRM) was applied to Ecuador so as to understand how vulnerable poor children are to WASH-related diseases, and to decompose vulnerability into exposure and susceptibility to disease; and third, an intervention through text messages was implemented and rigorously evaluated so as to understand the *causal effects* of reminders to improve care practices—including feeding, health, and hygiene—on children's health and nutritional outcomes.[2]

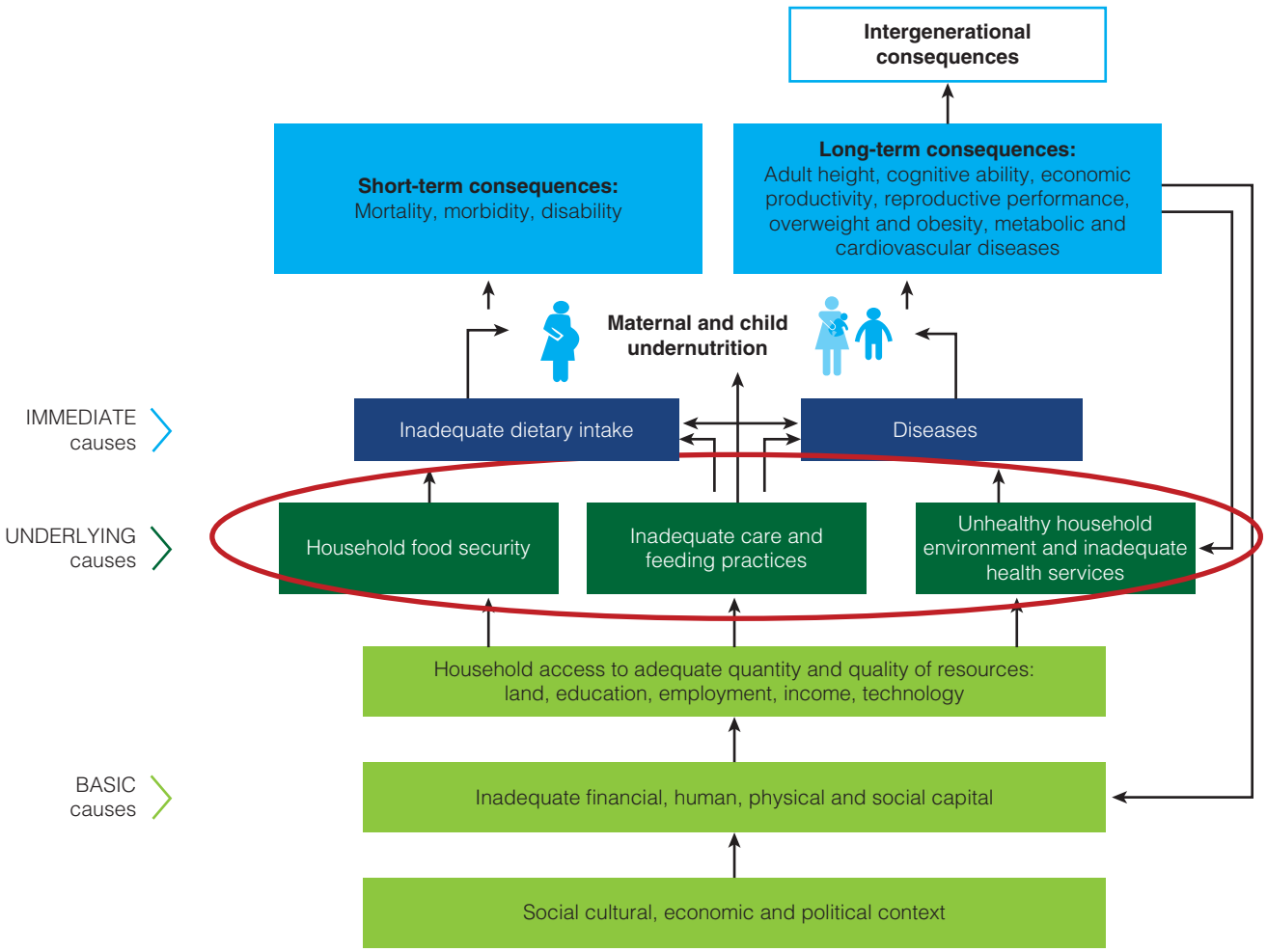
Synergies Analysis Using UNICEF-WASH Conceptual Framework for Nutrition

The UNICEF conceptual framework developed in 1990 (UNICEF 1990) emphasized the multisectoral nature of reducing child malnutrition and classified the dimensions explaining undernutrition into immediate, underlying, and basic causes.[3] These can range, for example, from inadequate diet (immediate cause) to inadequate financial capital (basic cause). This conceptual framework has guided operational and applied analytical work since 1990 and advocates that undernutrition be considered a multidimensional problem that requires multisectoral interventions (figure 4.3). The underlying determinants can be grouped in three pillars, namely food security, environment and health (including water supply, sanitation, and hygiene, or WASH), and child care practices. The UNICEF framework advocates that progress on one of the three pillars cannot necessarily substitute for lack of progress on other pillars.

One of the first systematic analyses aimed at filling this gap was proposed recently by the World Bank (Skoufias 2015). Focusing on eight developing countries in four regions, the study offers a systematic analysis of available information against ideal indicators; it provides an operational definition of "adequacy" for each of the three pillars or underlying causes; and it provides empirical evidence on the existence and magnitude of synergies across these pillars. Each of these contributions constitutes an important step toward (a) promoting more systematic thinking about what data gaps countries should aim to fill if they want to have a good assessment of the sources of malnutrition, and (b) providing an empirical tool that policy makers can use to identify synergies across sectors and promote integrated policies to combat malnutrition.

The UNICEF conceptual framework is operationalized by selecting a set of indicators and their associated thresholds, based on accepted international standards, for each of the three pillars: food security, environment and health, and child care practices. A child is then considered "adequate" in a given dimension if that child meets all criteria associated with that dimension (that is, is above or below the associated threshold for each of the indicators corresponding to that dimension). Taking the view that adequate access to one pillar cannot compensate for inadequate access to another pillar, a simple analysis of adequate access as defined in this paper can help identify potential binding constraints in efforts to reduce malnutrition. If applied to different subpopulations of interest—based on geographic or socioeconomic information, for example—the analysis could help prioritize interventions associated with the binding dimensions.

Figure 4.3: The UNICEF Framework



Source: Skoufias 2015.

In order to further explore the links between WASH and nutrition, as well as identify synergies among WASH and other components, Cuesta et al. (2015) extended the UNICEF framework by splitting health and environment into two pillars. Following this modified approach, the analysis for Ecuador analyzes adequacy and synergies among four pillars: food security, care and feeding practices, health, and environment (WASH). In short, the idea is to capture the expected increase in height for age associated with access to adequate services and care in four dimensions:

- *WASH components:* improved water on premises (SDG proxy), basic sanitation, and community- or village-level basic sanitation. Note that improved water (MDG definition) was used in the descriptive analysis in addition to the SDG proxy to show progress across definitions, whereas improved water on premises (SDG definition) was used in the discussion of adequacy and econometrics.

- *Food components:* exclusive breastfeeding (up to six months old), minimum meal frequencies (older than six months), two or more milk feedings, child dietary diversity score (older than six months).

- *Health components:* prenatal checks, vaccinations, assisted birth, and growth control visit for the child.

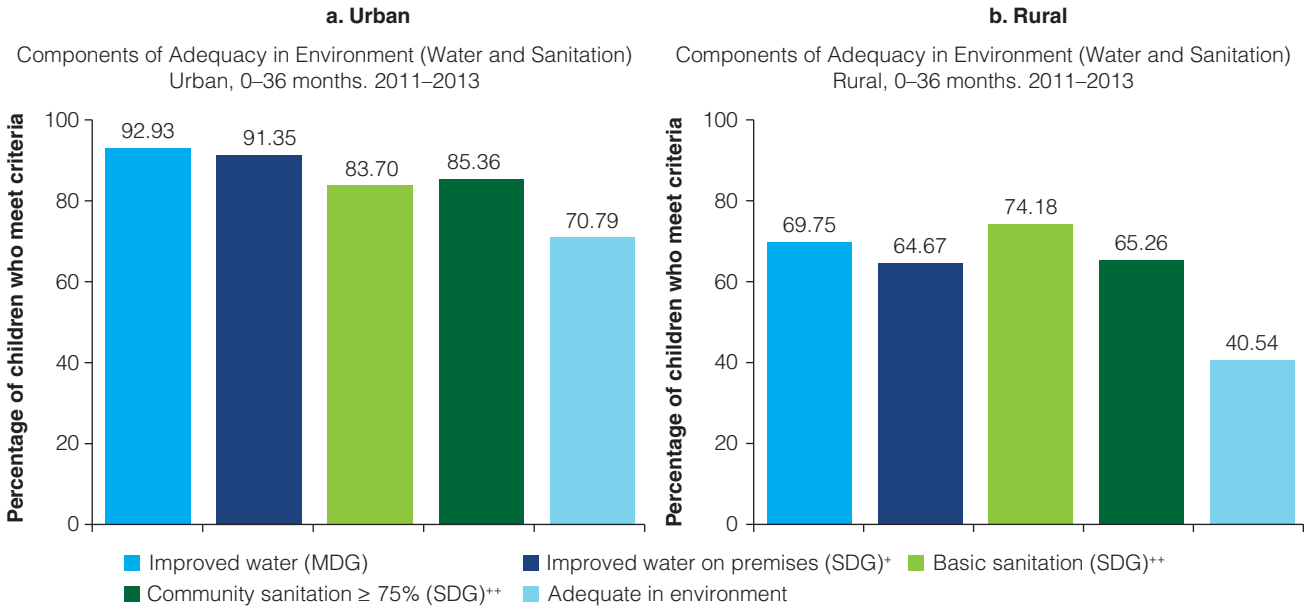
- *Care components:* exclusive breastfeeding (up to six months old), age-appropriate complementary feeding (older than 6 months), early initiation of breastfeeding, and mother's education.

In Ecuador there are large discrepancies between urban and rural children in the adequacy of access to the WASH dimension. Figure 4.4 presents the incidence of WASH adequacy for the sample of children used in the analysis, both national and by rural-urban disaggregation, based on data from ENSANUT 2011–13. Taking into account all components of WASH, coverage with adequate service is at 60 percent nationally, with urban children (71 percent) outperforming rural children (41 percent). Only 70 percent of rural children have access to improved water, compared with 93 percent of urban children. The prevalence of improved water on premises is relatively similar but lower, as expected, at 65 percent for rural children, compared with 91 percent for urban children. The comparison for basic non-shared sanitation again shows differences between rural (74 percent) and urban (84 percent) children, but not as marked as those for improved drinking water. Nationally, 78 percent of children have local-level improved sanitation (non-shared), but there are large differences between urban (85 percent) and rural (65 percent) children.

The regression analyses implemented to identify synergies across pillars follow two alternative specifications. In model B, presented in figure 4.5, each estimated coefficient reflects the expected increase in child height when a child gains adequate access to a *given combination* of dimensions relative to having inadequate access to all dimensions. In other words, this model shows which combinations of adequacies are not associated with increased height-for-age *unless combined with other dimensions*.

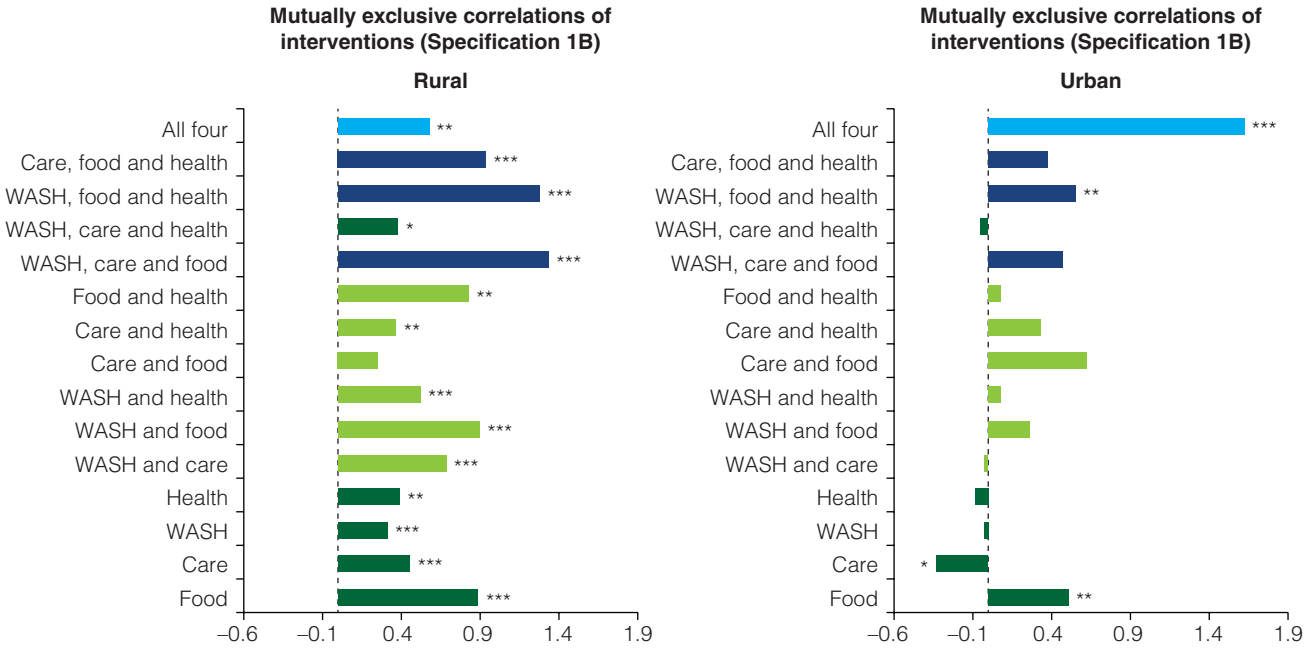
Thus, the regression results correlate height-for-age as the measure of nutrition with access to adequacy in the four dimensions that improve child nutrition.[4] Results confirm that adequacy in any single dimension has a statistically significant relationship to nutritional status, but of smaller magnitude than adequacy in multiple dimensions (figure 4.5). This is true not only for WASH but also for health and care, whereas adequate food in and of itself has a large impact on child nutrition. The findings hold across samples of urban and rural households.

Figure 4.4: Rural Children Have Lower Rates of Adequate WASH than Urban Children



Source: Farfan et al. 2016.

Figure 4.5: Synergies Coefficients Show the Importance of WASH Combined with other Dimensions



Source: Farfan et al. 2016.
Note: *** denotes significance at the 1% level (p<0.01); ** denotes significance at the 5% level (p<0.05); and * denotes significance at the 10% level (p<0.1).

All combinations of two dimensions are positively correlated, are of similar magnitude, and are bigger than one dimension (except for food). Combinations of adequacies in three dimensions have higher correlations than combinations in one or two dimensions, but only if they include food. Most results are driven by rural children, so focusing only on urban children requires at least three dimensions to make a difference in child height for age (with the exception of food). The results also show that not just *any* combination of adequate access to those services leads to significant improvements in child nutrition for every subpopulation group. In fact, significant sets of integrated interventions vary across types of households (rural versus urban).[5] Results specific to WASH adequacies are then compared with the correlations estimated for other dimensions that do not include WASH (that is, food, health, and care adequacies). Interestingly, the vast majority of coefficients reported for WASH have a positive sign and are statistically significant in the rural and national samples. These results indicate that WASH and other interaction effects are positively correlated with nutrition. Adequacies other than those including WASH show similar results: although their synergy effects are positively correlated with improved child nutrition, these effects are statistically significant mainly for the national and rural samples. This may be because of the already lower levels of stunting among children in urban areas, which make it harder to achieve additional improvements toward eradication.

What Is the Risk to Children's Health of Unsafe WASH?

Are poor people more vulnerable to risks posed by unsafe WASH conditions? Unsafe WASH conditions and other interacting factors such as access to health care and malnutrition together determine the risk posed by unsafe WASH—which inevitably is not distributed equally within populations, but rather reflects broader structural inequalities.[6] Most notable among these inequalities is poverty status, and it is among the poorest that both unsafe WASH conditions and these other factors are often concentrated. Using data for diarrhea from ENSANUT 2012,

Box 4.1: Developing a WASH Risk Index

What does "relative risk" mean? Relative risk (RR) is a concept commonly used in public health and epidemiology to quantify how a particular risk factor (for example, having an improved water source) may increase or decrease risk of a specific health outcome, compared with a baseline. A RR of less than 1 means a factor is protective in comparison to not having it. A RR greater than 1 means that a factor results in an increase in risk. We use RR information on various factors related to childhood health and diarrhea, some of which increase risk some of which decrease it. The quantitative estimates of RR are drawn from rigorous studies designed to assess causal effects within the literature.

How is each index calculated? Both the Exposure and the Susceptibility indices are calculated at the level of the child. Each index combines information on the child's household WASH characteristics and individual health vulnerabilities, and the relative risk associated with each factor. The RRs for each factor are multiplied together to develop a cumulative risk index. Some risk factors (for example, improved water, access to vitamin A) decrease risk. Others (for example, underweight) increase risk. It is important to note that the weight of each factor is neither equal nor arbitrary, but are based on what the evidence in the literature provides as a relative risk.

Source: Ryan et al. 2016.

the WASH PRM[7] implemented for Ecuador tests this hypothesis and provides some guidance on where WASH investments could deliver the best health gains for Ecuador as measured in DALYs.[8]

The PRM is designed to describe these overlapping risk factors and understand the consequences of their unequal distribution to support WASH investment strategies that more effectively and efficiently target areas of greatest need. Specifically, the PRM aims to

1. Quantify the proportion of WASH-attributable risk of diarrheal disease borne by the bottom 20 percent and 40 percent (wealth quintiles) of the population.

2. Estimate the potential health and other benefits of targeting WASH investments at the bottom 20 percent and 40 percent of the population.

3. Help identify priority areas for WASH investment where social (health) returns will be greatest.

A key part of the WASH PRM is the development of a WASH Risk Index. The index combines quantitative information on household WASH and health to quantify the relative risk of adverse child health outcomes due to inadequate WASH. In practice, *relative risk scores* (box 4.1) are combined into an Exposure Index (WASH variables) and a Susceptibility Index (health-related factors), and these two indices together constitute the combined Risk Index.

Findings on Exposure, Susceptibility, and Risk

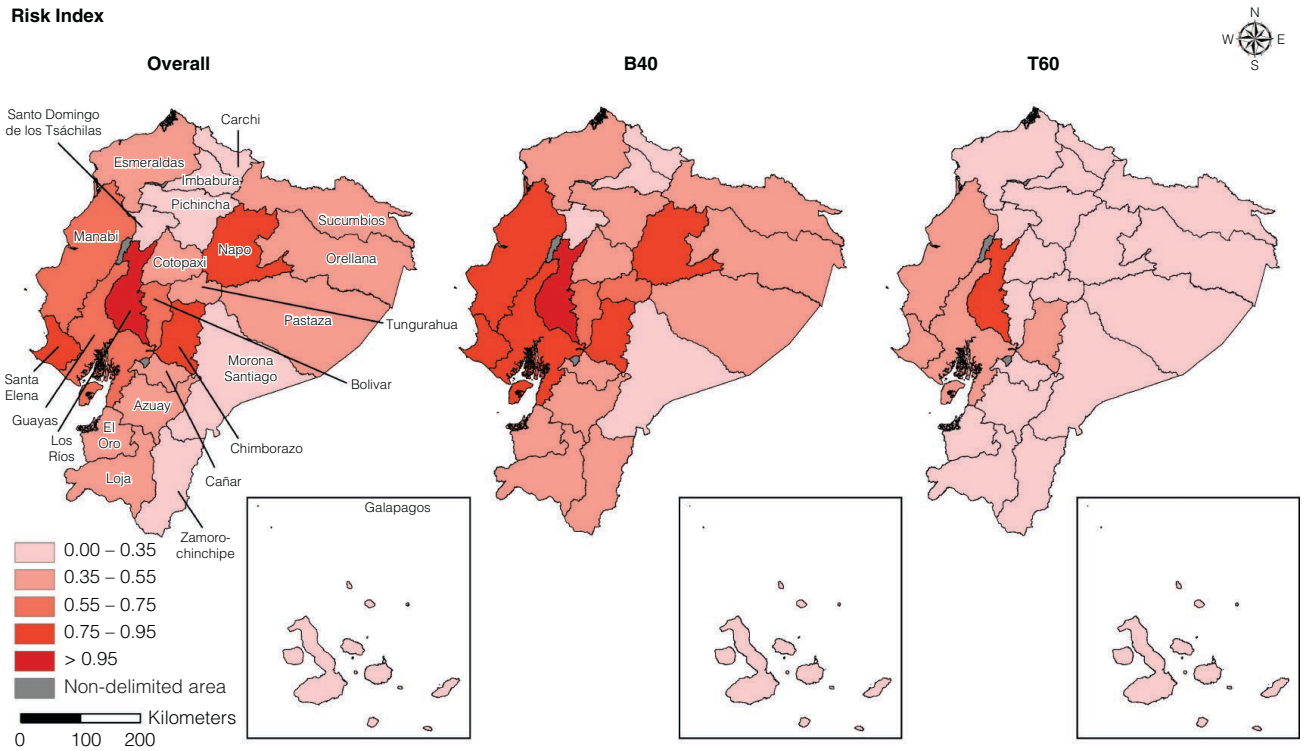
The WASH-related risk of disease varies significantly across regions and economic groups in Ecuador. The reasons are threefold: (1) variability in WASH related exposures—with children in poorer households having higher exposures; (2) the likely much greater vulnerability of these same children due to underlying poor nutrition and access to basic health services;

and (3) the fact that both WASH and health vulnerabilities are the product of underlying economic and geographic inequalities. Regions of Ecuador with the largest disparities in disease risk between the poorest (the bottom 20 percent) and richest (the top 20) quintiles are the provinces of Los Ríos, Napo, Chimborazo and Santa Elena (map 4.1). Areas with the highest risk index values for children are concentrated in the west and center regions of Ecuador, with children from Los Ríos being particularly vulnerable to disease risk. According to the sanitation and water improvement maps, children from Los Ríos, Manabí, Napo, and Santa Elena would experience the greatest risk reduction in response to improvements in water or sanitation access.

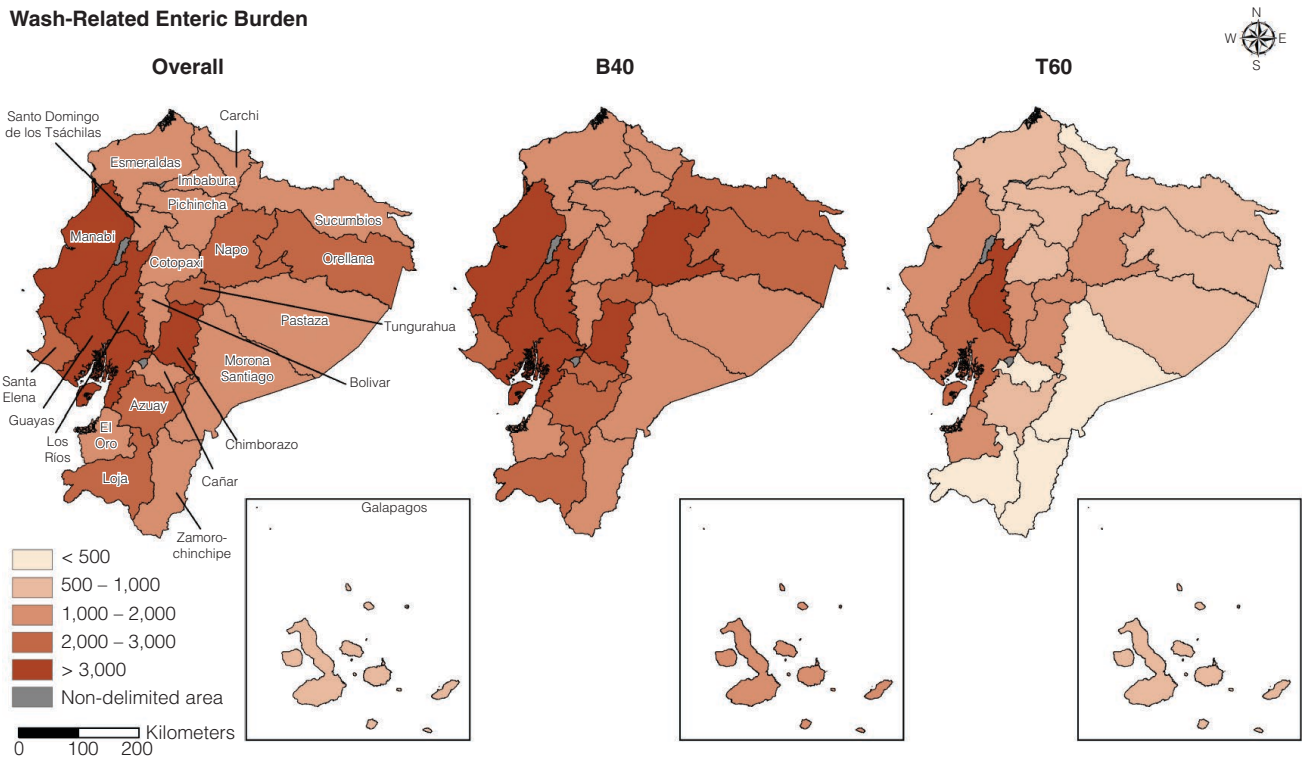
The national enteric burden associated with inadequate WASH is 2,596 DALYs per 100,000 children annually, which is equivalent to about 66 percent of the enteric burden estimated for the country. The WASH enteric burden for the poorest quintile is about 30 times greater than the enteric burden for the richest quintile. The WASH-related enteric burden is lower within urban populations than in rural ones, but the disparities in both persist: the burden for the urban poorest is 25 times higher than the richest, and 3 times higher for the rural poorest than the richest. In particular, children from Los Ríos have higher DALY rates related to inadequate WASH (map 4.2). The bottom 40 percent of children (center map) in Chimborazo and Los Ríos have the overall highest average burden for inadequate WASH in the region (4,326 and 4,280 DALYs per 100,000 children, respectively).

The analysis points to important knowledge gaps. There has been a large effort globally to understand and document the impact of WASH investments. This analysis suggests that overlapping vulnerabilities may substantially modify the impact of WASH investments. Analyses to understand how other vulnerabilities (e.g., environmental, health, and social) may change

Map 4.1: Regional Risk Index Values for Children Under Five, for Overall, Bottom 40 Percent, and Top 60 Percent Populations, 2013



Map 4.2: Inadequate WASH-Attributable Enteric Burden DALY Rate for Children under Five, for Overall, Bottom 40 Percent, and Top 60 Percent Populations, by Region



Source: Ryan et al. 2016.

the impact of WASH interventions could provide new insights in improving the impact of WASH investments on poverty reduction. This analysis suggests a number of priorities for designing more impactful WASH investment strategies.

Can Behavioral Interventions in WASH Help to Improve Child Nutrition Outcomes?[9]

Many studies around the world have reported reductions of diarrhea incidence through improvements in drinking water, sanitation facilities, and hygiene practices, especially cleaning food.[10] Most have reported that handwashing with soap is regarded as the most-cost effective solution. For instance, one study finds that handwashing promotion interventions decrease diarrhea incidence by 47 percent. Other studies have been able to identify the relationship between handwashing and health outcomes, including specific successful cases in India, Vietnam, and Indonesia.

Nevertheless, the literature that establishes a causal relationship between handwashing interventions (with or without soap) and either decreasing malnourishment in children or persistent diarrhea is still relatively sparse. There are also several studies that show no evidence of a relationship at all between provision of information or materials and/or infrastructure improvements and sustained improvements in handwashing or changing behavior. For example, in West Bengal, 99 percent of households owned soap; however, only

13 percent reported washing their hands with soap before eating. In addition, 38 percent of households had access to sanitary latrines, yet 68 percent continued to defecate in the open.

The failure of these studies in providing consistent evidence that supports a relationship between better hygiene interventions and improved nutrition and health inspired the support of the *Texting for Nutrition Impact Evaluation* in the Ecuador WASH Poverty Diagnostic. This intervention aims to establish a causal relationship between text messages sent to caregivers of children under age three to promote WASH behavior change and improvements in child health and nutrition.

WASH Context in Chimborazo

Chimborazo province suffers from extremely high rates of chronic malnutrition, with 49 percent of children under five stunted in 2012.[11] The province is predominantly rural and has a predominantly indigenous population. The distances between people's homes and local health centers are long. Poverty affects 53 percent of households and socioeconomic conditions place significant constraints on families' choices about which foods to produce and sell and which foods to consume in the home (ECV 2014). According to the most recent census in 2010, approximately 20 percent of the rural population in Chimborazo did not have access to any type of bathroom or latrine, only 30 percent had piped water within the house, and only 42 percent had access to a public water source—all clear structural barriers to good hygiene that have implications for the nutrition of children.[12]

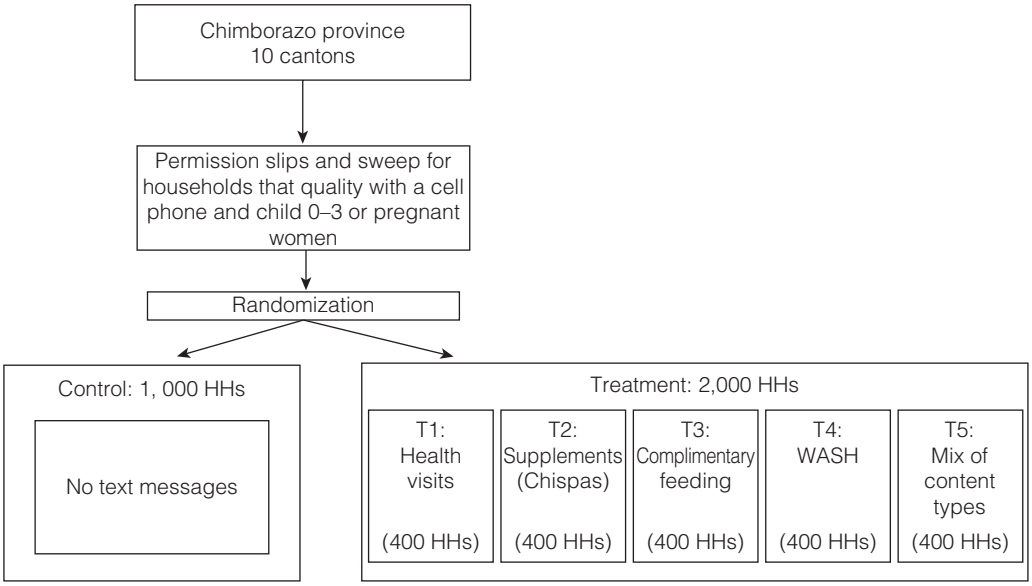
A high proportion of children under three in rural areas of Chimborazo receive few health checkups and their caregivers have poor WASH practices.[13] Fieldwork for this research in 2013–14 showed that these children had much lower access to regular checkups than recommended. A consequence of this infrequent contact with health workers is a lack of knowledge on the part of caregivers on the importance of treating water in the transition to complementary feeding for children, the risks of waterborne illnesses, and the importance of exclusive breastfeeding during the first six months. Behavioral barriers in both rural and urban areas include low rates of boiling or treating water provided to children under five, inadequate food preparation (including washing foods and surfaces), inadequate food preservation (covering foods), and poor handwashing habits (not washing at key moments—before eating, after defecating, after tending to animals—and not using soap).

The *Texting for Nutrition* project used text messages to improve nutrition and health outcomes for children by encouraging health behavior change in caregivers. Caregivers participating in the project received 75 text messages over the course of 14 months, beginning in January 2015 and ending in March 2016. The messages were sent twice a week in four rounds, with several-week breaks between rounds. The message content was designed with four types of behavioral mechanisms in mind: providing timely new and relevant information, positively encouraging caregivers, using persuasive social norms language, and sending reminders to keep key messages "top of mind." The messages were developed in collaboration with the Ecuadoran Ministry of Health.

The content of the text messages varied along five thematically focused treatment arms that each encouraged a unique set of behavior changes (figure 4.6). In treatment arm 1 (T1), caregivers were encouraged to bring children to their local health center for regular and timely checkups. In treatment arm 2 (T2), caregivers were provided information about when they should initiate complementary feeding and how they could increase children's diet diversity. In treatment arm 3 (T3), caregivers were encouraged to feed children micronutrients—specifically an iron supplement locally called *Chispas*. In treatment arm 4 (T4), caregivers were encouraged to treat drinking water or ensure that water consumed by children was potable, and to wash their hands regularly, as well as to improve general food preparation and hygiene practices. In treatment arm 5 (T5), caregivers were sent a mix of text messages along all four content types

from T1, T2, T3, and T4. In addition, caregivers with children under six months of age were sent messages about exclusive breastfeeding; however, since this treatment type was age-specific, it is not included in the accompanying impact evaluation. A crosscutting and consistent theme of the messages was positive encouragement for caregivers. Table 4.1 shows the sets of messages sent to caregivers during the trial period. Boxes 3 and 7 of the table relate to WASH messages exclusively.

Figure 4.6: Texting for Nutrition Treatment Arms



Source: Zella and Vera 2017.
Note: HH = household. Numbers presented are according to endline sample sizes, not programmatic random assignment.

Table 4.1: Nature of Text Messages and the Theory of Change

	Types of SMS - and Channels of change			
	Outcome	Channel	Mechanism	Type of SMS
1	Timely visits to health centers	Change the value that mothers or families place on visits themselves	Norms	Potential SMS could target the long-held attitudes/cultural perceptions towards health centers.
			Efficiency of investment of time	Information about the timing of when vaccines will be available to limit visit inefficiencies.
			Efficiency of investment of time	Information that may reduce their wait time.
		Thinking about visits more frequently	Reminders - top of mind	Reminders of when ppl should do visits

table continues next page

Table 4.1: Continued

	Types of SMS - and Channels of change			
	Outcome	Channel	Mechanism	Type of SMS
2	Consumption of nutritional supplements chispas	Change in knowledge about usage	Correct Usage	Messages to clearly articulate correct usage of supplements
		Change in perceptions of negative side effects	Reduce negative perception and suspicion	Side effects: dispelling suspicion or explaining when they may make children sick as well as discuss the adjustment period for children, but this is normal.
		Increasing how often mothers think to use chispas	Reminders - top of mind	Remind mothers to use chispas. The other content messages may also function as reminders.
		Change in level of access to chispas	Reminders - top of mind	Remind mothers to ask for chispas and other supplements at their next clinic visit and that they are available for free
3	Consumption of clean/potable water (this is especially important for children between 6-24 months)	Increase the regular practice of boiling water prior to drinking for 0–24.	Value placed on boiling water	Text message noting that if giving water to children between 0–24 especially, it is important to boil water to prevent illness.
		Change in community level water treatment	Empower community members on the issue of water treatment	Text message to explain the chlorine issue, to perhaps mobilize families to demand proper treatment of water.
4	Consumption of a greater variety of nutritious foods	Increase the variety of nutritious foods prepared and increase the time investment in cooking fresh food rather than purchasing prepared food	Generate new ideas on what to prepare and encourage investment of time in the preparation of nutritious foods	Recipes
		Increase nutritional content of regularly prepared foods	Generate new ideas on how to prepare food	Information regarding food preparation - tricks of things to add to increase nutritional benefits.
		Increase purchase or preparation of nutritious foods	Value placed on eating meats and a variety of nutritious foods	SMS on importance of eating meats and a variety of nutritious foods

table continues next page

Table 4.1: Continued

	Types of SMS - and Channels of change			
	Outcome	Channel	Mechanism	Type of SMS
5	Exclusive breastfeeding from 0–6 months, Breastfeeding frequency	Increase in milk production and breastfeeding frequency	Encourage mothers to raise their liquid intake levels (especially in first 6 months) to facilitate milk production.	Information about how much liquid lactating mothers should be consuming
		Increase in milk production and breastfeeding frequency	Reminders - top of mind	Reminders to mothers to consume more liquids
		Increase breastfeeding frequency	Improve detection of when to feed	Information about how to identify early hunger before crying. (this was something mentioned at the health centers as malnutrition babies may not have the energy to cry)
		Increase durration of breast feeding	Knowledge about health benefits to maintenance up to six months	Information about health benefits for children that breastfeed exclusively for the first six months.
		Increase durration of breast feeding	Positive encouragement	
6	Timely integration of solid foods for children	Increase in on-time introduction of semi-solid and solid foods for children	Information	Information about when to integrate solid foods, which solid foods should be used to start, how to identify when it's the right time.
7	Frequency and timing of hand washing by caregivers (prior to preparing food, after defecation, and prior to interacting with infants)	Increase frequency of washing hands	Value placed on washing hands	Information about the importance of washing hands before and after preparing food
		Increase frequency of washing hands	Reminders - top of mind	Reminder to wash hands
8	Healthy food preparation and hygienic practices	Increase separation of animal raising spaces from food preparation spaces	Knowledge about risks of fecal contamination	Information about the dangers of animal raising in food preparation areas

Monitoring of the project revealed that the response from caregivers was overwhelmingly positive. The messages were being read and remembered, and created a generally positive connection with caregivers. Approximately four months into the program, the World Bank project staff, with the TDI coordinator, conducted three follow-up monitoring focus groups. The objective of the focus groups was to gather qualitative information from text message recipients about the frequency with which they received and read the text messages, their perceptions of the messages, whether they shared them with other people within the household, whether they liked them, and whether they wanted to receive more.

Responses to each of the questions varied; however, in general caregivers did receive the text messages and enjoyed doing so. They wanted to continue receiving the messages. Several caregivers recited some of the messages from memory. Several people commented that the messages make them feel like they are being good parents, that it is a specialized program for them that encourages them as parents and provides them information to learn. The thematic types of messages people mentioned liking most were on ***hand washing***, specific recipes or food recommendations, exclusive breastfeeding, and reminders to go to the health centers. Recipients expressed an interest in continuing to receive the text messages. Responses about frequency varied widely, some saying that they wanted to receive the messages more frequently, such as daily, while others wanted to receive them less frequently and suggested once a month. Caregivers liked that the messages always had their names in them and were clear. Some people explained that they shared the messages with spouses; others said they kept the messages for themselves. No respondent shared the messages with neighbors.

RCT Design Overview

Texting for Nutrition was designed and implemented as a randomized control trial. Upon enrollment into the program, caregivers were randomly assigned to one of five treatment arms, one of which was the WASH text messages, or to a control group. The evaluation allows for the estimation of the effects of the program on improving nutrition and health outcomes for children (clustered random assignment at the parish level), comparing treatment households with control households. The study achieved balance across the WASH treatment group (T4) and the control group. Compared with the control group, the sample population in T4 had no statistically significant differences in average demographic characteristics.

The primary outcome of interest for the program and the evaluation were anthropometric measures of stunting for children. In addition, the evaluation estimated the effects of the program on the following behaviors:

- Caregiver visits to local health centers with their children for regular check-ups
- Consumption of nutritional supplements with a particular focus on the locally available iron supplement *Chispas*
- Child diet diversity, exclusive breastfeeding from birth through six months of age, and timely integration of solid foods for children
- Frequency and timing of handwashing by caregivers (prior to preparing food, after defecation, and prior to interacting with infants), boiling or treating water served to children for consumption, and maintaining clean cooking and food preparation spaces

Preliminary results suggest that the Texting for Nutrition intervention had large and statistically[14] significant impacts on improvements in health and nutrition. These impacts are observed in measures of childhood illnesses including coughs and respiratory illness, fever, and hospitalization, as well as in anthropometric measures.

Results Indicate Positive Effects of the Program on Indicators of Child Health and Nutrition

The intervention caused a large decline in the rate of experience of illnesses in the last two weeks as reported by caregivers. Children in the treatment group are 30 percent less likely to have had a cough or respiratory illness in the past two weeks than children in the control group. This decline represents a reduction in the experience of respiratory illness of 9.2 percentage points. Looking across nine potential illnesses, we also see that children in the treatment group are 9.3 percentage points less likely to have experienced illness in the last two weeks than children in the control group, representing a 23 percent decline.

There were statistically significant and large impacts in health indicators across all treatment arms. Children in T1 households, which received messages on the importance of attending regular health checkups, show a reduction in respiratory illnesses and in the index of nine possible illnesses. Children in T2 households, which received messages on the value of micronutrients, experienced a reduction in respiratory illnesses and fevers. Children in T3 households, which received messages on diet diversity and on timely complementary feeding, do not show reductions in illnesses experienced over the past two weeks but display an approximately 40 percent reduction in the rate of hospitalizations over the preceding 12 months, dropping from 4 percent of children in the control group to just 2 percent of children in T3. Children in T4 households, which received text messages on WASH behavior change, showed reductions in experience of respiratory illness, fevers, and hospitalization (table 4.2) Lastly, children in T5 households, which received messages in a mix of thematic areas, show reductions in their experience of respiratory illness and fevers.

The program led to statistically significant improvements in anthropometric measures, with heightened impacts on the under-two population. In the full sample of children under six years of age, we observe increases in weight for height by 0.07 standard deviations in both weight for height and BMI for age. The subpopulation of children under two experienced larger gains of a 0.35 standard deviation increase in weight for age, a 0.32 standard deviation increase in weight for height, and a 0.31 standard deviation in BMI for age. These findings are robust when controlling for additional characteristics as well. The effects by treatment arm show that improvements in anthropometric measures in the under-two population are being driven by T1, T2, T3, and T5. The WASH treatment arm does not lead to statistically significant impacts on anthropometric measures.

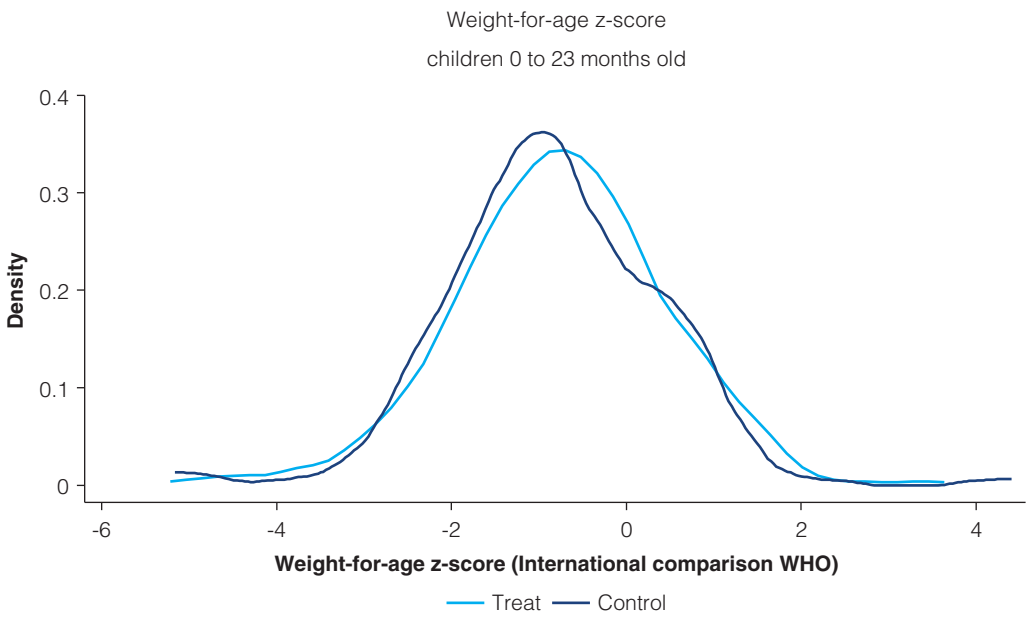
Turning to the behavioral outcomes to test the channels through which change may have taken place, the study comes up short, unable to show impacts on measures of behavior change. In behaviors particular to the WASH treatment arm, no changes were observed in self-reported handwashing frequency or observed soap in the household, and less use of a clean towel for hand drying. However, measuring behavior change is challenging without objective observation measures, which are difficult to implement and face ethical constraints. So although impacts were not observed in the mostly self-reported measures of behavior change, the evidence shows that the behavioral treatment of text messages is driving the observed effects in health and nutrition.

Table 4.2: WASH-Related Health Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Diarrhea in the last two weeks		Coughing, a cold, difficulty breathing in the last two weeks		Fever in the last two weeks		child was sick in the last two weeks (9 possible illnesses)		child was hospitalized in the last 12 months	
t1	−0.0157	−0.0162	−0.0903***	−0.0860**	0.0006	0.0031	−0.0937***	−0.0872**	−0.0001	0.0015
	(0.0150)	(0.0148)	(0.0323)	(0.0333)	(0.0142)	(0.0142)	(0.0347)	(0.0355)	(0.0110)	(0.0110)
t2	−0.0287*	−0.0256	−0.0907***	−0.0864***	−0.0325**	−0.0294*	−0.0909***	−0.0831***	−0.0062	−0.0052
	(0.0168)	(0.0164)	(0.0270)	(0.0268)	(0.0152)	(0.0150)	(0.0302)	(0.0300)	(0.0093)	(0.0093)
t3	0.0058	0.0054	−0.0565*	−0.0522*	0.0196	0.0202	−0.0561*	−0.0514	−0.0196**	−0.0183**
	(0.0200)	(0.0195)	(0.0303)	(0.0309)	(0.0197)	(0.0200)	(0.0331)	(0.0341)	(0.0088)	(0.0088)
t4	**−0.0296***	**−0.0280**	**−0.0981*****	**−0.0926*****	**−0.0385****	**−0.0351****	**−0.1111*****	**−0.1042*****	**−0.0200****	**−0.0193***
	(0.0167)	(0.0173)	(0.0306)	(0.0304)	(0.0163)	(0.0164)	(0.0338)	(0.0350)	(0.0099)	(0.0099)
t5	−0.0017	−0.0063	−0.1207***	−0.1182***	−0.0367**	−0.0346**	−0.1077***	−0.1077***	−0.0017	−0.0027
	(0.0170)	(0.0166)	(0.0274)	(0.0272)	(0.0141)	(0.0144)	(0.0348)	(0.0348)	(0.0115)	(0.0114)
Constant	0.0716***	0.0798*	0.3361***	0.2673***	0.0596***	0.0268	0.4329***	0.3402***	0.1046***	0.1208***
	(0.0246)	(0.0404)	(0.0301)	(0.0579)	(0.0210)	(0.0266)	(0.0274)	(0.0482)	(0.0177)	(0.0219)
Control Mean	0.1148		0.3121		0.1019		0.4075		0.0445	
Observations	3,763	3,710	3,765	3,712	3,763	3,710	3,765	3,712	3,765	3,712
R-squared	0.0247	0.0547	0.0455	0.0490	0.0233	0.0272	0.0452	0.0516	0.0154	0.0164
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strata Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unbalanced controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Source: Zella and Vera 2017.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 4.7: The Intervention Has a Positive Effect on Weight for Age



Source: Zella and Vera 2017.

Notes

1. See literature review cited in Ryan et al. (2016).
2. The UNICEF and PRM conceptual framework analyses complement each other. They are based on secondary sources of information already in place (such as ENSANUT 2011–13 and household surveys) and approved methodologies developed especially for this WPD. Although these analyses do not estimate the causality between WASH and health outcomes, they present indicative associations that provide evidence for the fact that the WSS sector by itself cannot solve the health and nutrition problems in the country, and vice versa. These are mutually exclusive, and thus the need for multisectoral interventions given the nature of these dynamics.
3. This analysis draws from the background study "Synergies in Child Nutrition: Interactions among Health, Environment, Food Security, and Child Care in the Case of Ecuador" by Farfan et al. (2016).
4. Specifications were estimated for the national sample and for urban-rural disaggregation in two models: with mother's education and without.
5. When using a less comprehensive definition of adequate care (without mother's education in the care dimension), most combinations of adequacy in *two* dimensions do not have significant impact and the set of packages of adequacy in dimensions is slightly different, driven mainly by adequate care, and adequate care and food. The estimated coefficients are negative for adequate care only and for adequate WASH and care only because the results are driven by breastfeeding (rather than mother's education), which is more prevalent among rural and poor households. Even though breastfeeding is an element in both adequate food and adequate care, the key difference seems to be that adequate care without maternal education is substantially more prevalent in rural than urban places, while the reverse is true when we include maternal education. We also see more negative coefficients in the urban subsample when we eliminate maternal education from adequate care.

6. This subsection draws heavily on Ryan et al. (2016).
7. The WASH PRM initially focuses on one health outcome—diarrhea—as the most important outcome in terms of attributable disease burden. This approach explores how poor WASH service conditions and these other factors combine to determine the distribution of the disease burden within populations, stratified by wealth and geography.
8. DALYs (disability-adjusted life years) measure overall disease burden, expressed as the number of years lost due to ill health, disability, or early death. Nationally, the WASH enteric burden for the lowest quintile is about 30 times greater than for the highest quintile. The PRM analysis uses DALY estimates from the 2013 Global Burden of Disease project for the distribution of enteric disease burden attributable to inadequate WASH by subpopulations.
9. This subsection relies heavily on Zella and Vera (2017).
10. See references cited in Zella and Vera (2017).
11. ENSANUT 2013. Data were made available in 2013 but collected in 2012.
12. 2012 census data analyzed by the author.
13. TDI: six rounds of household data collected between 2012 and 2015 by a local nutrition team. Analyzed by the author.
14. The statistical significance for the analysis was at 10 percent.

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Chapter 5
Constraints to Improving Water Service Delivery to Rural Areas

The purpose of this section is to identify service delivery constraints and potential solutions for the subsector of rural water.[1] As became evident in chapters 3 and 4, access to water in rural areas is a priority if the country wants to improve access, quality, and equity in service delivery. This is even more supported by the finding that 31.8 percent of water in rural areas is contaminated, of which 20 percent comes from local community providers and 12 percent from protected wells. There is still a long way to go to provide universal and quality access in rural Ecuador, with important differences among the regions of the Coast, the Highlands, and Amazonia. This is true despite important investments made by the Government of Ecuador, as shown in the next subsection. According to the National Water and Sanitation Strategy (ENAS in its Spanish acronym) for 2008–16,[2] national investment in water coverage increased tremendously during this period, from approximately US$64 million in 2008 to a projected US$225 million as of 2016. It has fluctuated over the years, but overall there has been a steady increase (except in 2010).

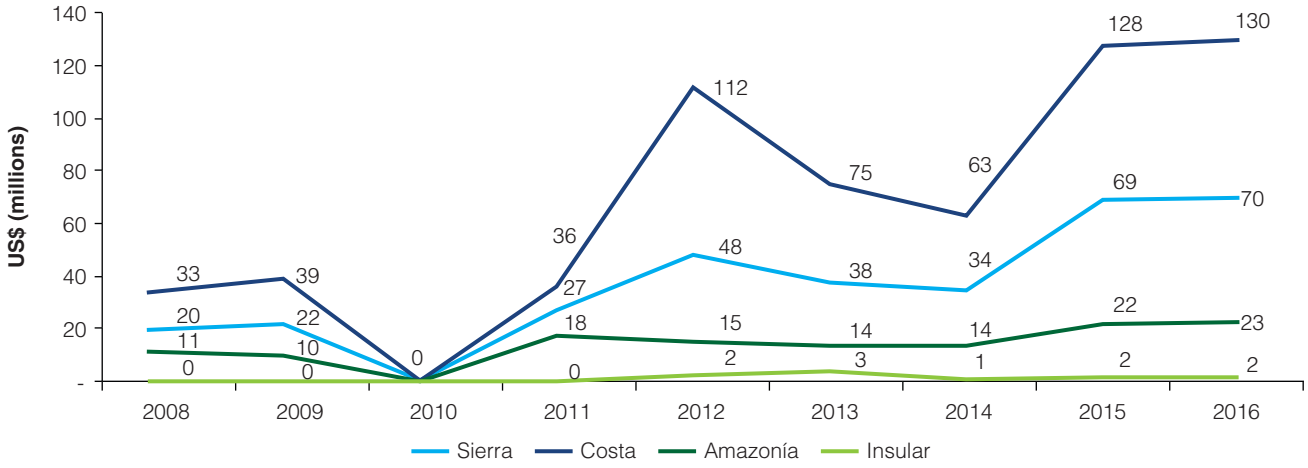
What are the binding constraints on good performance in water service delivery in the rural areas of the country? The regions of the Coast and the Highlands were the main beneficiaries of public WASH investment (with investments multiplied by 4 and by 3.5 times, respectively), reaching a projected US$130 million and US$70 million in 2016, respectively (figure 5.1). Although there has been progress, towards the end of 2014, access to improved sources of water in rural areas was significantly lower than in urban areas, and significantly lower than in Quito and Guayaquil regions, as mentioned in chapter 2.

Historical Background and Current Institutional Arrangements in WSS

Gaps between urban and rural development in Ecuador have to do in part with a process in which municipalities favored investing in urban parishes over rural ones. Parishes (the smallest political administrative category in the country) thus had incentives to become autonomous municipalities (also called cantons), in order to access fiscal transfers from the central government. Accordingly, most municipalities are small and depend greatly on the central government for funding, which affects their management capacity and their ability to provide sustainable WSS services. In response, rural areas have organized themselves to fill this space and obtain access to WSS, among other services.

As a response to the low capacity of rural municipalities to provide basic services, the central government stepped in and provided basic services directly. This went against the legal

Figure 5.1: Investments in Water and Sanitation, by Region, 2008–16



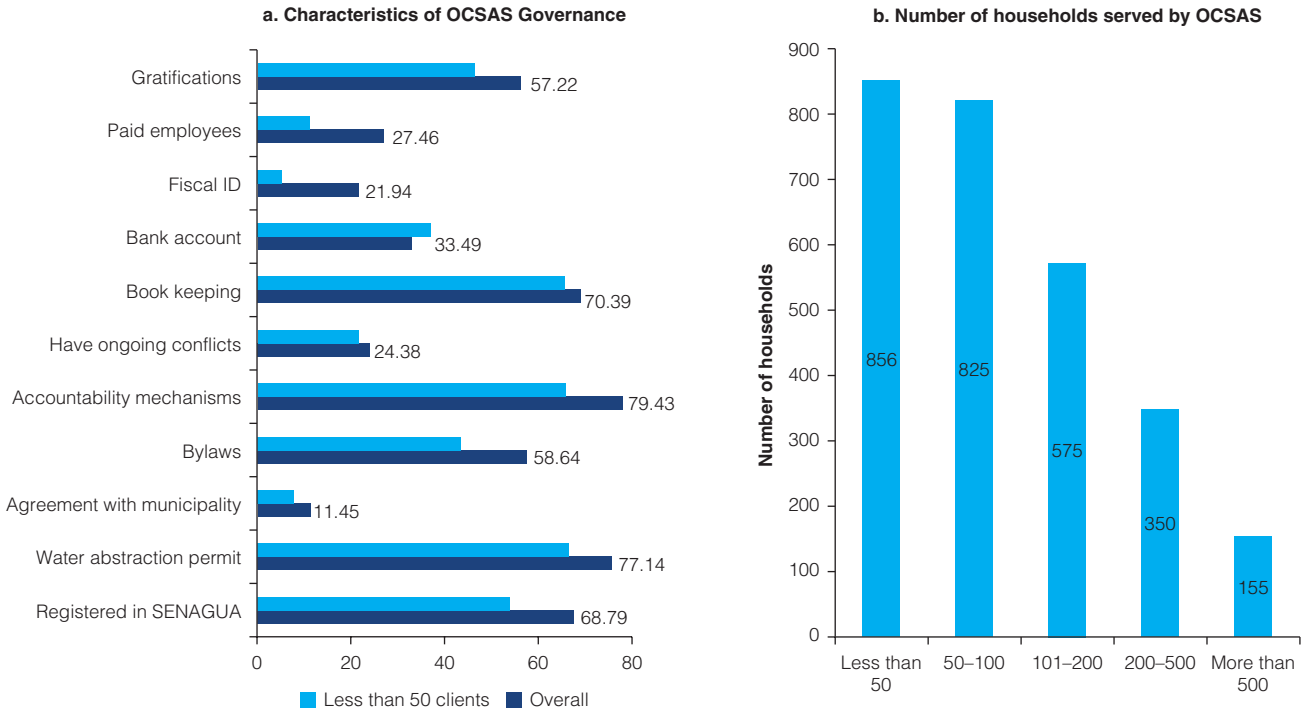
Source: Elaborated by the World Bank, based on ENAS (2008–16).

mandate that municipal governments provide these services, including WSS, which was established since 1945. From the mid-1960s onwards, community-based organizations providing WSS gained momentum. Legislation issued in 1978 gave the then-called JAAPs (Juntas Administradoras de Agua Potable, in Spanish) an important role in this regard but failed to recognize municipal authority over rural services and gave municipalities no mandate to create and support the JAAPs, with the unsurprising implication that municipalities are not fulfilling their mandate to provide WSS services.

Community-Managed Water Service Providers (OCSAS) as a Pillar of Service Delivery in Rural Areas

An analysis of water service delivery in rural settings run by Organizaciones Comunitarias Prestadoras de Servicios de Agua (OCSAS) or community-managed water service providers was conducted as part of this WPD.[3] This analysis is important because more than 30 percent of the population lives in rural areas. Information provided by SENAGUA was analyzed for the first time to characterize the OCSAS (70 percent of which are former JAAPs), which offer services to a population of more than 2 million in the Highlands and the Coast. According to the 2016 survey conducted by SENAGUA among representatives of 2,730 OCSAS, the typical OCSAS supplies water to 162 households and does not provide sanitation services; the majority (61 percent) serve fewer than 100 families, and only 6 percent serve more than 500 families. From the average size of the OCSAS analyzed and the rural population with access to water by public network in 2016, it can be estimated that the number of operational OCSAS is about 5,000. Only 27 percent claim to have employees (an average of 1.4 employees with a monthly salary of US$293), and 57 percent claim to pay some type of bonus to voluntary workers (an average of 1.3 volunteers with a monthly gratuity of US$103.55). Moreover, only 6 percent of the OCSAS claim to have an operating ratio greater than one. The average monthly billing per utility is US$354, while the average monthly income is US$249; that is, the collection efficiency is 70 percent. This means billing and revenue per customer are, on average, US$2.01 and US$1.41, respectively.

Figure 5.2: OCSAS Governance and Number of Households Served



Source: Based on 2016 data from SENAGUA.

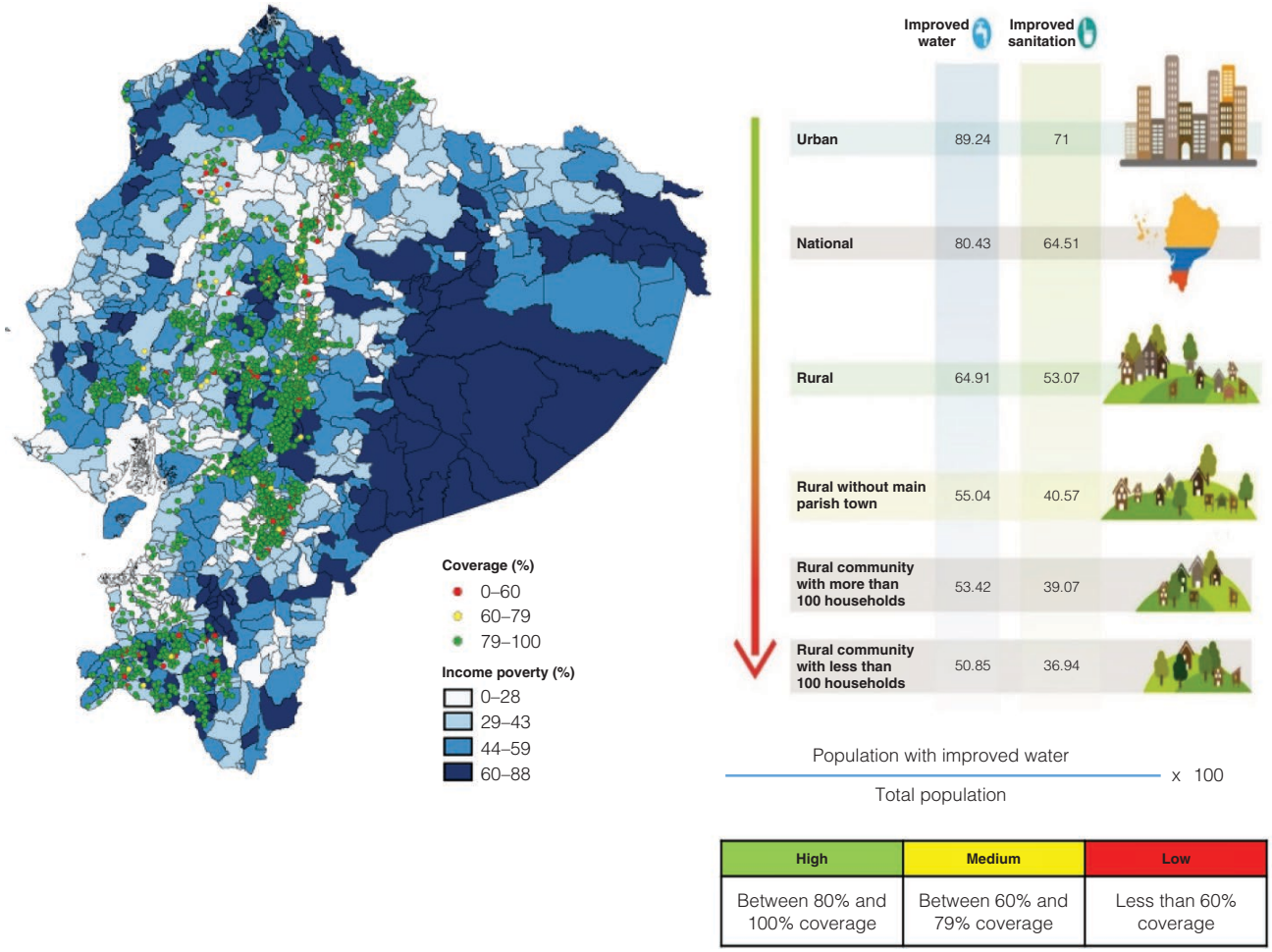
Results from the OCSAS Analysis[4]

Overall, the analysis shows that rural water services face the same limitations found in urban areas of small and medium parishes; that is, they have limited revenue and capacity to stock up on the necessary supplies and conduct adequate management of the water disinfection process. The analysis of the quality of service provision by OCSAS in rural areas was based on indicators of self-sufficiency, water revenues relative to savings, quality, and continuity of water delivery,[5] which were mapped to gain granularity. One difference in rural areas is that the urban subnational level of government, at the parish level, allocates public resources to cover these limitations on the basis of subsidies (tariffs, infrastructure, personnel) at the cost of increasing inequality and a widening urban-rural gap. That is, subsidies benefit disproportionally the better-off in urban areas.

Rural areas that are served by an OCSAS have high water coverage (note that this is only improved access, not safe access) (map 2.3). This fact reflects the effort to extend the service to new users or new zones within the communities, and the interest of the population to connect to the networks to access these services. However, a limitation of this effort is that it does not always take place using technical criteria, which can lead to network limitations or a loss of quality in the service in some areas because of inadequate water pressure, among other factors. This is an additional element of granularity that this work adds on rural coverage related to the management by OCSAS.

Although these OCSAS seem capable of providing access to piped water, they may not be financially able to deliver (map 2.4). Limited revenues lead to a reduction of payments to operators, a reduction in the supplies needed for the disinfection process, delays of payments of other services, and so on. In short, these observations reveal a practice of reducing

Map 5.1: Poverty Map and Water and Sanitation Coverage by OCSAS



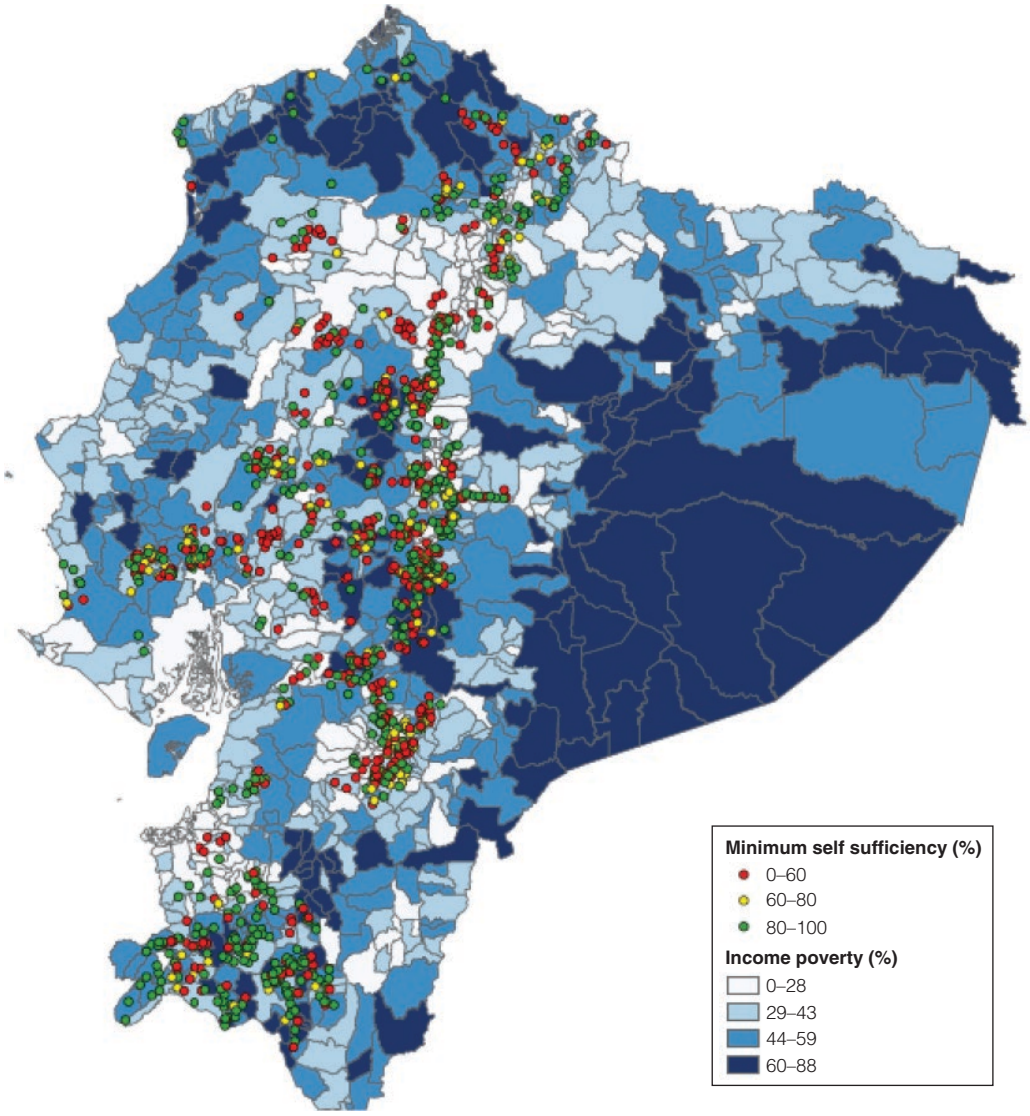
Source: Solís 2016, based on data provided by SENAGUA.

expenditures to the detriment of quality or of compliance with labor benefits. The latter shows weakness in community management.

Regarding collection efficiency, there is a clear tension between the ability of users to pay more for the service and the ability of providers to collect even the low fees that they currently charge, much less higher fees. Yet providers do require larger budgets to provide a better service, so there is a case here for a subsidy mechanism that helps OCSAS improve the services. OCSAS should also make more efforts to increase collection—in many cases people are not willing to pay because they know that the service will never be cut. Map 2.5 illustrates that OCSAS in the Coast are less efficient in collection than OCSAS in the Highlands.

One of the criteria for measuring quality of service is water treatment with daily disinfection. Only 43 percent of the JAAPs analyzed provide high water quality service; that is, a daily disinfection process. As shown in map 2.6, this issue is critical in the Coast and in the zones of higher poverty incidence such as the center Highlands (map 2.6). Part of the reason for this pertains to small budgets, but there is also low technical capacity, especially in the smaller organizations, in addition to limited supplies or periods with no supplies. The weak administrative financial management by most organizations reflects the capacity issue again,

Map 5.2: Poverty Map and Minimum Self-Sufficiency



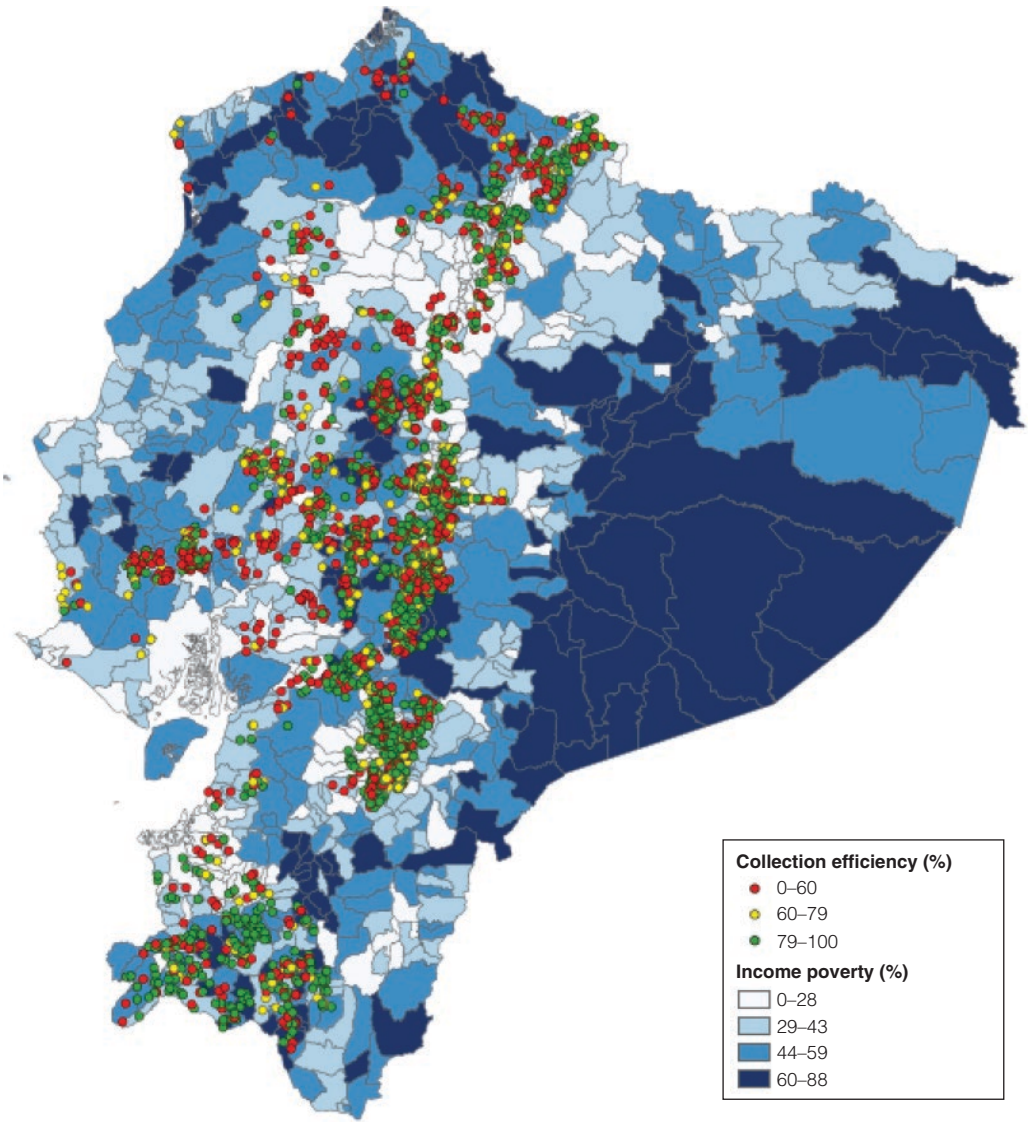
Source: Solís 2016, based on data provided by SENAGUA.

which arises in part from the traditional relationship of JAAPs with SENAGUA, and the fact that only 30 percent of JAAPs have skilled or trained staff, while just 34 percent of them have a bank account. National authorities need to pay more attention and provide support to JAAPs.

Continuity of service measures reflect big differences between seasons. During the winter, 87 percent of JAAPs have high continuity of service, while during the summer this figure drops to 62 percent of JAAPs (map 2.7). This is partially a consequence of the reduction of water flow rates caused by the deterioration of drinking-water sources and of water recharge zones. Authorities need to pay attention to this infrastructure problem.

Analysis of the rural water provision mechanism reveals significant weaknesses in the governance structure of the rural, community-managed water utilities. In particular, the low and unpredictable availability of financing forces these utilities to rely on unpaid workers and to forego important maintenance and upgrading investments (including regular water disinfection). In turn, rural customers' low ability to pay for water and their low incentives to pay regularly

Map 5.3: Poverty Map and Collection Efficiency

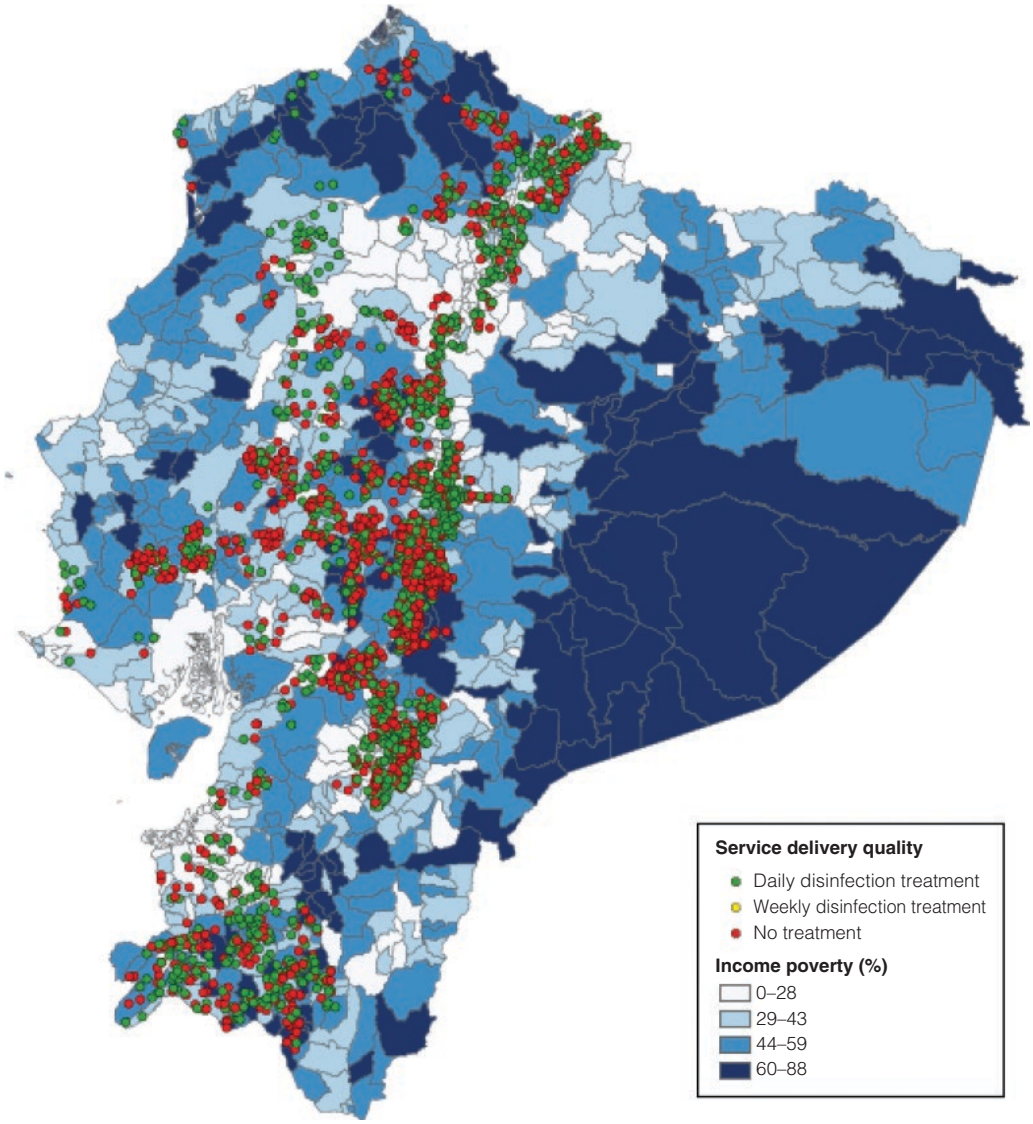


negatively affect the collection capacity of these utilities, further undermining their financing options. This perpetuates a situation of low capacity and low-quality service provision.

Current Challenges and Opportunities to Improve Rural Water Service Delivery

An analysis of public-community partnerships was done following the legal framework that regulates WSS provision in rural areas. Given the current weaknesses of the OCSAS and the constitutional prohibition on private sector participation in the water sector, the current legal framework and the new set of institutions created by the government during the last five years underscore the importance of establishing public-community partnerships as vehicles to strengthen OCSAS so as to guarantee the quality and sustainability of services.[6] The new legal framework mandates that SENAGUA and municipalities promote and support these partnerships to improve rural WSS.

Map 5.4: Poverty Map and Water and Service Quality

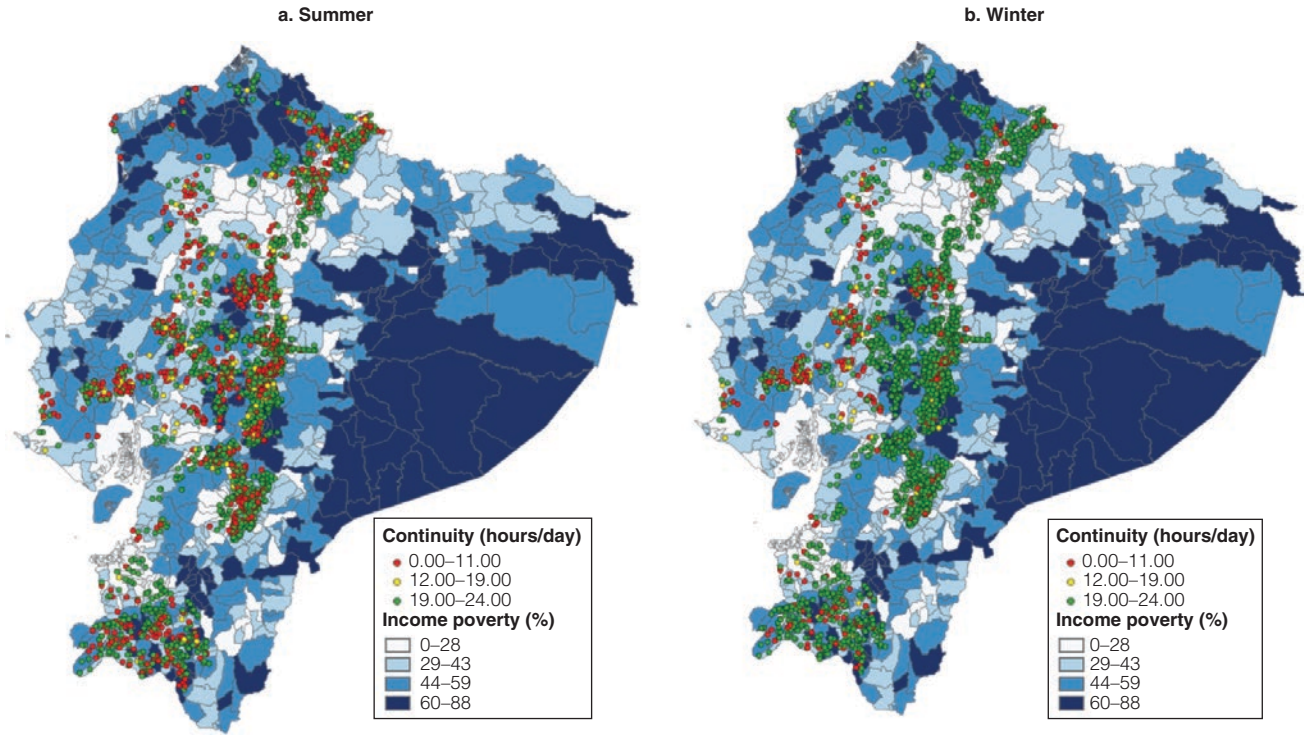


Source: Solís 2016, based on data provided by SENAGUA.

From the Perspective of the Planning and Budgeting Functions

Finding 1: More rural WSS investments can be achieved during the participatory planning and budgeting process. This exercise provides OCSAS the opportunity to influence local municipalities to prioritize rural WSS investments. However, municipalities either regulate participation in these processes in a very indiscriminate manner, hence supporting enduring political clientele practices, or do not implement a public hearing—or do not have enough budget to do so. Finally, the part of the budget that is open to participation is small and very variable, reducing the chances of integrating WSS priorities during the process. In addition, the multipurpose nature of OCSAS, their large number, and their small size undermine the visibility of the sector, fragment the dialogue, and encourage patronage.[7] In some locations, the capacity of the OCSAS to demand that local municipalities make WSS investments is limited because in the Amazonia

Map 5.5: Poverty Map and Continuity, by Season



Source: Solís 2016, based on data provided by SENAGUA.

and the Coast, OCSAS are organized around productive activities rather than around basic needs. Organization around basic needs shows a weak capacity to influence municipal agendas.

From the Perspective of Access to Financing and Execution of Rural WSS Infrastructure

Finding 2: Lack of municipal fiscal capacity requires that other funding sources be used to expand coverage. Even before the fiscal condition of the country deteriorated in the past two years it was clear that public loans from the BDE and subsidies from the central government to municipalities would be needed to reach targets of universality in access to water at the municipal level. According to the ENAS, the rural area investment needs in WSS are close to US$2.3 billion, half of what is needed in urban areas.

For WSS rural investments, the BDE is practically the only source available. However, the tax for added-value of properties that BDE requires municipalities to collect (CEM), is not well adapted to the realities in the rural sector.[8] One alternative would be that rural beneficiaries pay BDE fees through unpaid work by the community members, called "mingas," although this is not legally enforceable. In addition, rural infrastructure projects cannot receive funding from the BDE, because the technical feasibility studies have to be approved by SENAGUA, and timing for such approvals is unpredictable (22 to 29 months) owing to lack of capacity (see appendix A).

This leads to the frequent abandonment of important projects in rural WSS that were prioritized by local communities through the participatory budgeting process. Consequently most municipalities limit rural investment budgets in all sectors (not WSS necessarily) to the availability of fiscal transfers after deducting for recurrent expenditures.[9] Some municipalities offset this lack of lending resources from the BDE by designing and implementing projects by

"direct administration mechanism," supported by mingas, all of which increases ownership. This approach is not used extensively because of the lack of technical capacities in municipalities and the weakness of the rural community OCSAS. Finally, some small municipalities avoid the BDE's red tape by outsourcing design and construction but face a lack of execution capacity because their staff is not ready to apply public procurement procedures, and by avoiding SENAGUA's norm for appropriate rural technologies endangers the sustainability of projects.

From the Perspective of Governance and Service Management

Finding 3: The relationship between municipalities and OCSAS is key to establishing successful public-community alliances. Most OCSAS in the country adopt the form of JAAPs, which SENAGUA has promoted. This form of OCSAS is the only one recognized by the law to manage rural WSS when a municipality does not fulfill its mandate. The legislation, from 1978, is complemented by a 2016 SENAGUA norm on the operation and organization of JAAPs.

Meeting de jure norms enacted by SENAGUA to formalize JAAPs' legal, labor, and tax status is too cumbersome and expensive, weakening informal community rules and practices such as volunteerism and reciprocity that prevail in communities. SENAGUA's legislation does not give municipalities either a role to help JAAPs form or to grant water licenses, both of which discourage them from forming a bond with JAAPs. The only role that municipalities are fulfilling is a *credential* that the municipality does not provide rural WSS, hence allowing the formation of JAAPs to this end and enabling them to obtain a water license to provide the service in the rural areas. But this also encourages some mayors to disengage from their municipal responsibilities over JAAPs as they have deemed JAAPs to be more autonomous. Consequently, despite the emphasis on promoting public-community partnerships, the interpretation and the effective implementation of this recommendation are highly unstable and dependent on the balance of local powers and interests.

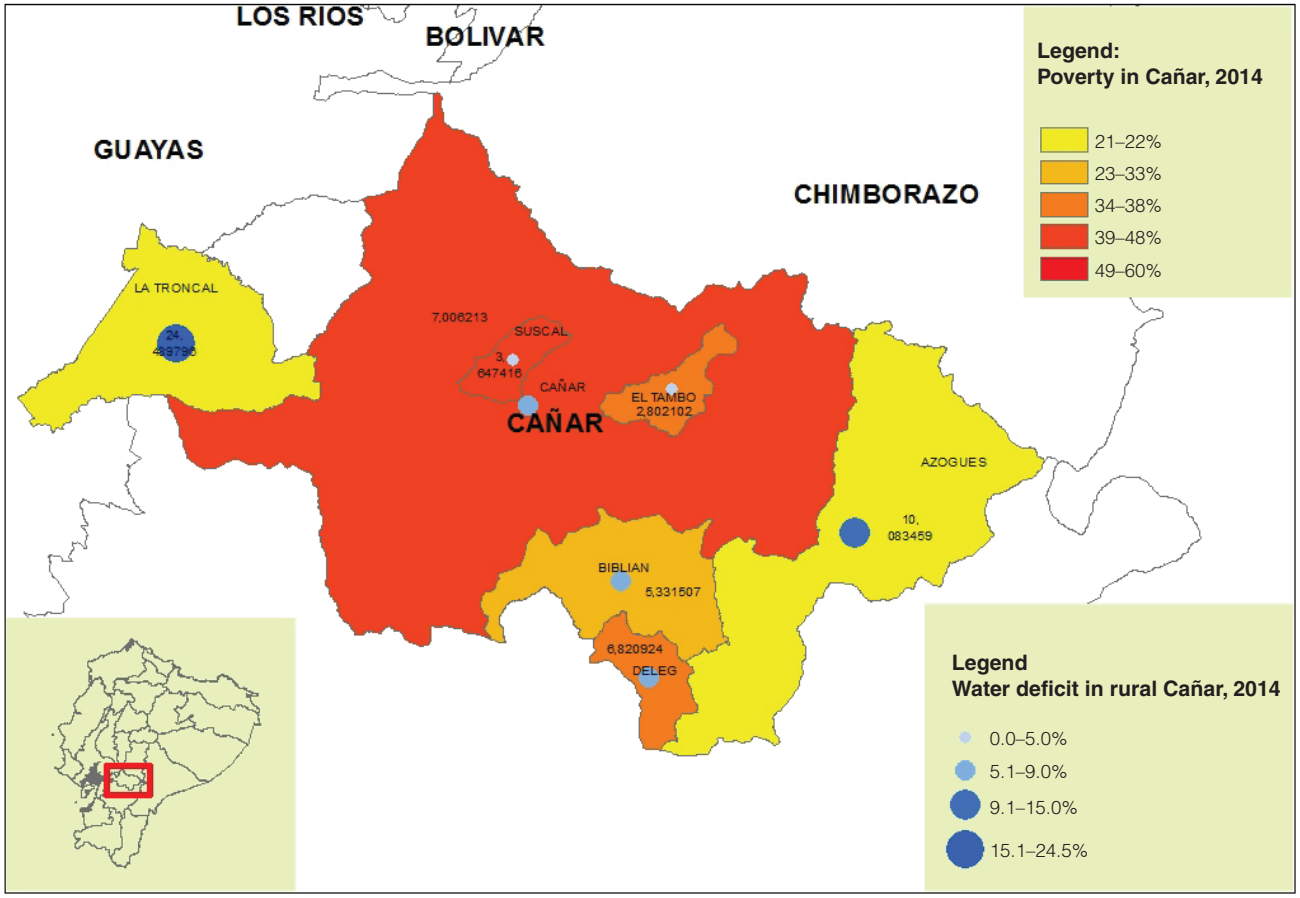
Despite its good intentions, the law that regulates public-community partnerships only reflects the political equilibrium of forces at the local level. The Ley Orgánica de Recursos Hídricos y Aprovechamiento del Agua (LORHUAA) promotes public-community partnerships for legitimate community management. However, it does not oblige the municipalities to support the OCSAS or JAAPs in preparing a plan to improve services that are the JAAPs' responsibility to execute, unless the JAAPs are incapable of doing so, which in turn would permit municipalities to intervene—even though their capacity is low too. This is why this approach works in some cantons or municipalities and does not work in others. The public-community partnership model is a coordination platform that adds financial, human, and knowledge resources to maximize public investment. This type of coordination includes a community service provider (known as OCSA or JAAP) that does pro bono work but with a high level of commitment in the community. The LORHUAA underscores the importance of establishing public-community partnerships to partially solve some of the key problems of rural water quality and access in Ecuador.

This partnership model was analyzed in six rural municipalities (cantons) in the country. They were selected on the basis of poverty and access to water, and to keep a balance of geographic locations (among the Coast, the Highlands, and Amazonia): Suscal and Cañar in the Highlands, Rioverde and Quinindé in the Coast, and Lago Agrio and Francisco de Orellana in the Amazonia. All these cantons show improvements in access to WSS, but progress in some of them has been below the provincial average. All six cantons are predominantly rural and poor, even poorer than the rest of their provinces, except for the Amazonia cantons, where all poverty rates are similar (see table 5.1). Of the six cantons, Cañar is where this partnership model has worked the best. This is not the only good experience, but it is the only one that has been more formally structured and is more stable. Accordingly, it is less likely that political patronage will affect its performance. Table A.2. shows the degree to which the different elements analyzed hold in each canton and therefore the degree of successful implementation of this partnership as shown by current levels of access despite high poverty.

Table 5.1: Poverty Rates of Selected Areas, by Region, Province, and Cantons, 2014

Region	Poverty by Region (%)	Province	Poverty by Province (%)	Canton	Poverty by Canton (%)
Highlands (Sierra)	18	Cañar	29	Cañar	42
				Suscal	48
Coast	24	Esmeraldas	41	Quinindé	42
				Rioverde	58
Amazonia	39	Sucumbíos	35	Lago Agrio	31
		Orellana	38	Orellana	33

Map 5.6: Poverty vs. Gaps in Improved Water Coverage, by Canton in Cañar, 2014



Recommendations for the Public-Community Partnership Model to Deliver Better WSS in the Rural Sector of Ecuador

Previous analysis shows the challenges faced by the public-community partnership model to improve water service delivery in rural areas. This is one of many institutional arrangements to deliver water in rural areas that is being fostered by the current administration as part of the solution to increase access and improve the quality of service provision in rural Ecuador.

From the desk review analysis, complemented by field work in six cantons, the team proposes the following actions to enhance the results of this partnership and to contribute to universal and safely managed access to water for rural Ecuador:

a) **Improve municipal participatory budgeting and planning processes, to ensure OCSAS participation**, and ensure that this participation is not mediated by other actors such as parish governments. This could be achieved "from above"—better regulation of these processes from SENPLADES, preparing guidelines and disseminating good practices on planning and municipal budgeting, also in collaboration with SENPLADES and AME.

b) **Encourage the creation of associations of community organizations**. In parallel, SENAGUA should continue to promote the creation of OCSAS associations at the parish, municipal, and national levels, to assist the community movement in structuring its dialogue with local and sectoral authorities, and to press "from the bottom up" the processes of municipal planning and participatory budgeting.

c) **Give OCSAS more voice in the sectoral advisory bodies at the highest level**. Just as the voice of the OCSAS should be considered in local forums, these community organizations should be given a space for direct participation in the consultative and sectoral oversight bodies established by the National Strategic Water System, namely the Intercultural and Plurinational Water and Watershed Councils. However, the usefulness and effective functioning of these sectoral platforms, as it happens with their participation in municipal planning and budgeting processes, involves a clear definition of the financing mechanisms of these consultation bodies.

d) **Encourage municipal governments to create mechanisms to support the OCSAS in the technical, legal, and administrative and tax fields**. For this, the regulatory agency (ARCA) should continue to promote the formalization of agreements between the municipalities and the OCSAS that operate in their jurisdiction. Ideally, this agreement between the municipal government and the OCSAS should be articulated as a delegation of the service, making clear the roles and responsibilities of each of the parties, and considering, among other things, municipal support—direct or through other platforms—to the OCSAS in the administrative, accounting, and tax, and labor areas, in addition to technical support. The regulation of LORHUAA should be reviewed to give a formal role to municipal governments in the process of establishing JAAPS and in resolving conflicts between JAAPS and the community as a whole.

e) **Eliminate the barriers that impede the use of BDE credits for the financing of rural water and sanitation projects.** To this end, it is essential to support municipal governments in the task of updating their property rural cadaster with technical assistance from the BDE and from the Ministry of Agriculture, Livestock, Aquaculture and Fisheries, and in the promotion of tax payment culture that could permit the application of the BDE's fee CME in rural areas. Likewise, it is advisable to improve mechanisms to ease credit for small works executed by direct administration, among other changes in eligibility criteria.

f) **Streamline and improve technical feasibility processes to reduce discretion in granting permits, and make the duration of this phase shorter and more predictable**. The optimization of this process can be (i) a simplification of the process for certain projects, based on criteria of technical complexity, contractual value, origin of funds, or demonstrated capacity by the executing entity; or (ii) the total or partial delegation of these responsibilities to other public entities (subregional governments, financing entities, or others), private (insurance) or nonprofit (professional associations).

g) **Strengthen the capacity of SENAGUA to manage requests for approval of technical feasibility and improvement plans** both through training existing staff—particularly in unconventional technologies and community development—and by providing them with additional material and human resources.

h) **Encourage the creation of municipal associations and of regional and national federations of JAAPS.** Such groups would increase the visibility of community-based service providers and serve as instruments for the continuous training and capacity building of JAAPS. Sector authorities should ensure the participation of these organizations in municipal planning and budgeting processes and give them voice in basin- and sector-level coordination platforms.

Notes

1. It should be noted that this exercise is part of a broader World Bank effort to help Ecuadoran authorities move the development agenda for the WSS sector forward. Through this broader effort the Bank supported the formulation of the national WSS strategy, identifying financial and execution capacity bottlenecks affecting sector capacity to achieve universal access to WSS. The analysis undertaken as part of the WPD was more restricted, focusing on identifying organizational and structural barriers that affect local governments' willingness and ability to establish effective alliances with OCSAS—understood as a formal collaboration agreement to improve rural WSS services, clearly establishing the roles and responsibilities of the two parties to improve rural WSS services and taking advantage of the installed capacity at both OCSAS and municipalities.
2. The ENAS aims to serve as the official guide for the WASH sector for achieving total coverage of drinking water and sanitation services in all the national territory in the coming years, in order to fulfill the goals under the PNBV and the National Strategy for Equality and the Eradication of Poverty (ENIEP in its Spanish abbreviation).
3. The key actors (see table A.1 in appendix A) in rural service provision are (i) the Secretariat of Water Provision (SENAGUA), which designs technical assistance and targets subsidies; the Agency for Regulation and Control of Water (ARCA), which informs the development of the regulatory agenda for service provision in rural areas; (iii) the donor community, which supports the design and targeting of interventions; and (iv) the municipalities and JAAPs, which frame the dialogue for the establishment of public-community alliances.
4. This section relies heavily on Solís (2016).
5. It is the first time that an analysis such as this has been done in Ecuador.
6. This is established in the Ley Orgánica de Recursos Hídricos y Aprovechamiento del Agua (LORHUAA).
7. Ecuador has 221 municipalities and about 5,000 OCSAS. On average, there are 22 OCSAS per municipality. In some the number can reach 100 (in Cañar municipality, for instance).
8. The "Contribución Especial por Mejoras" (CEM) is a tax that subnational governments may apply to capture part (up to 50 percent) of the property value increase enjoyed by the beneficiaries of publicly financed infrastructure projects. The BDE encourages municipalities to introduce the CEM, providing them with technical assistance for its introduction and making it mandatory for certain lending products. Levying the CEM in rural areas is challenging, as it encounters social resistance and important technical challenges, including the dearth of reliable rural land registers (fewer than half of municipalities had an updated register in 2014) and difficulties associated with collection (in rural areas, collection is done through OCSAS and revenues do not go to municipalities).
9. The difficulty of estimating the time required to obtain licenses and viability complicates the proper sequencing of the completion of bidding documents of the different projects that make up the master plan. Therefore, driven in many cases by the desire not to lose windows of financial opportunity (access to credit windows with preferential conditions or municipal budgetary allocations), municipal authorities often embark on infrastructure construction projects that are incomplete.

Reference

Solís, H. 2016. "Caracterización de los servicios de agua y saneamiento del 40% más pobre del Ecuador." Background report for the WPD Ecuador, Quito, Ecuador.

Chapter 6 Conclusions and Recommendations

This WPD provides a comprehensive overview of the progress in water and sanitation coverage in Ecuador. On many fronts, the results are encouraging: coverage of improved access to water and sanitation has been steadily increasing in the last 15 years, in both urban and rural areas, and the country has met its MDG targets as a nation. Ecuador has also made significant progress in closing the gaps in improved access between urban and rural areas, and across the socioeconomic spectrum. This is the result of the priority that the government has given to providing universal basic services, reflected both in the National Development Plan (SENPLADES, 2013) and in the creation of a Water Ministry (SENAGUA), which has itself built a comprehensive Water and Sanitation Strategy (SENAGUA, 2015).

The analysis also presents new findings regarding outstanding challenges and bottlenecks that, if unaddressed, will prevent further progress and might even create risks of reversal in some cases. In short, the findings suggest concrete directions for future WSS policy, including the following:

- *Put more emphasis on closing urban-rural gaps, in particular for sanitation.* As discussed in chapters 3 and 4, rural areas still lag significantly behind urban areas in access to improved sanitation, and most of the progress observed thus far is explained by an increase in septic tank solutions, which are predominantly private investments for which there are no technical quality standards. As chapter 4 discusses, increased access to improved sanitation could have significant health benefits by reducing diarrheal disease risks for the poorest children, in particular in certain Coast and Amazonia provinces, where such risks are most prevalent. In turn, reducing disease risk can lead to lower malnutrition rates, provided also that health and other services are available to mothers and children during the critical first 1,000 days of life, as shown in chapter 4.

- *Address the water quality problem.* As chapter 3 shows, nationwide 20 percent of households' drinking water is contaminated with *E. coli*, potentially causing serious health risks. About one in eight urban households and one in three rural households are affected, so it is crucial that the government start enforcing quality controls at the utility level to ensure the water disinfection protocols are being implemented. In rural areas this is a challenge, as most water service providers are severely constrained financially and lack the resources to procure the necessary inputs. In the very short term, the government can raise awareness of the problem among households and provide information on how to disinfect water at home to minimize the risks of infection.

- *Facilitate rural investment in WSS.* As explained in chapter 5, the responsibility for providing WSS services lies with municipal governments, which for historical reasons, have relied on community-based organizations (OCSAS or JAAPs) to deliver these

services. However, these organizations are atomized and have very low capacity and no resources to undertake significant investments to improve delivery of services (including clean water).

- In the short term, to strengthen the ability of municipalities and service providers to invest and grow, the government could further encourage the implementation of participatory approaches for municipal planning and budgeting processes to involve these community organizations more actively. It could also envision a more aggregated level of participation for OCSAS and JAAPs, for instance, through regional and national federations, to give them a voice in planning, implementation, and basin- and sector-level coordination platforms. Importantly, easing BDE's eligibility criteria for rural WSS projects is key to increase access of rural providers to much needed investment financing.

- In the medium term, the government could channel transfers to local governments for WSS interventions using results-based financing mechanisms. Doing so would help to shift the focus from inputs to results at the municipal level, thus promoting a more efficient use of scarce investment resources. The government could also consider the adoption of WSS management models, leading to economies of scale and the professionalization of service delivery. This would imply, for instance, promoting the creation of pan-municipal utilities. Finally, to ease the financing constraints on investing in WSS in rural areas, the government could explore options for developing innovative financial instruments to leverage funding to the sector, for instance, through blended financial mechanisms.

The path to addressing these challenges in the present economic and fiscal context remains unclear. Ecuador is going through a difficult period, and some of the policy choices presented here imply additional investments to strengthen local (especially rural) service providers. In the current context, with many competing priorities, policy decisions in the water sector will be weighed against many others, and it is thus important to understand how to prioritize actions in their order of complexity, but also in their need for additional resources. This is an area in which the World Bank Group could assist the government in defining a clear short- and medium-term action plan that can help the country tackle some of these issues sequentially and with a manageable fiscal impact.

References

SENAGUA (Subsecretariat for Drinking Water and Sanitation of the Secretariat for Water Provision), IDB (Inter-American Development Bank), World Bank, and FECASAL (Spanish Fund for the Water and Sanitation Cooperation in Latin America and the Caribbean). 2015. "Estrategia Nacional de Agua Potable y Saneamiento, ENAS." Quito, Ecuador.

SENPLADES (National Secretariat for Planning and Development). 2013. "Plan Nacional del Buen Vivir 2013–2017." Quito, Ecuador.

Appendix A
The Architecture of Rural WASH Service Delivery

Table A.1: The Allocation of Roles at the National and Local Levels Involves Many Actors

	Central/National					Provincial	Municipal	Service provider	Civil society actors	Informal service provider/ NGO/ private sector	Other municipal GAD actors
Functions/ institutions	SENAGUA	Ministry of health (MOH)	Ministry of finance	State development bank (BDE)	National regulatory agency (ARCA)	Hidrographic demarcation of water (regional SENAGUA)	MOH district offices	Municipal water offices or Public Utilities	Rural water community boards or JAAPs		
1. Policy, Legislation & Regulation											
Legal framework	X										
Policy and technical codes	X				X						
Regulation, tariffs for cost recovery	X				X						
Water quality standards	X	X			X		X				
2. Planning and Budgeting											
Preparing a National Plan, Budget, Objectives	X										
Subnational plans, budgets and objectives	X							X			
3. Financing of Infraestructure, O&M &TA											
Design and construction of water systems			X**	X				X			X*
JAAPs legal organization, management, TA	X					X		X	X		X*
Water system operation								X	X		X*
Maintenance and spareparts								X	X		X*

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Table A.1: Continued

Functions/ institutions	Central/National					Provincial	Municipal	Service provider	Civil society actors	Informal service provider/ NGO/ private sector	Other municipal GAD actors
	SENAGUA	Ministry of health (Moh)	Ministry of finance	State development bank (BDE)	National regulatory agency (ARCA)	Hidrographic demarcation of water (regional SENAGUA)	MOH district offices	Municipal water offices or public utilities	Rural water community boards or JAAPs		
4. HR training, capacity building											
Recruitment of personnel for local service provision								X	X		
Capacity building of local staff for service provision	X					X		X			
Hiring and firing local staff								X	X		
Wages for local service provision staff								X	X		
Who pays local staff											
Reports on local staff in charge of service provision											

table continues next page

Table A.1: Continued

Functions/ institutions	Central/National					Provincial	Municipal	Service provider	Civil society actors	Informal service provider/ NGO/ private sector	Other municipal GAD actors
	SENAGUA	Ministry of health (Moh)	Ministry of finance	State development bank (BDE)	National regulatory agency (ARCA)	Hidrographic demarcation of water (regional SENAGUA)	MOH district offices	Municipal water offices or public utilities	Rural water community boards or JAAPs		
5. Service Provision (local or through external parties)											
Responsible to design and construction of water systems	X							X	X		X*
Legal owner of the water system	X							X	X		
Responsible for systems rehabilitation											
Responsible for assets O&M								X			
Who bills and collects from users								X	X		
Responsible for buiding capacity building of JAAPs in O&M if communities or JAAPs perform such role?	X					X					

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Table A.1: Continued

Functions/ institutions	Central/National					Provincial	Municipal	Service provider	Civil society actors	Informal service provider/ NGO/ private sector	Other municipal GAD actors
	SENAGUA	Ministry of health (Moh)	Ministry of finance	State development bank (BDE)	National regulatory agency (ARCA)	Hidrographic demarcation of water (regional SENAGUA)	MOH district offices	Municipal water offices or public utilities	Rural water community boards or JAAPs		
Responsible of community participation & organizacion for planning water systems								X			X*
Supervises and check for quality of water ystems?	X	X			X	X	X	X			
Responsible in Government of performance monitoring of service provider or staff					X			X			
6. Production (Responsibility to deliver water directly or through NGO)											
Design and construction of water distribution systems	X							X	X	X	X
Responsible for water system rehabilitation								X	X	X	X
Responsible of O&M								X	X	X*	X*

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Table A.1: Continued

Functions/ institutions	Central/National					Provincial	Municipal	Service provider	Civil society actors	Informal service provider/ NGO/ private sector	Other municipal GAD actors
	SENAGUA	Ministry of health (Moh)	Ministry of finance	State development bank (BDE)	National regulatory agency (ARCA)	Hidrographic demarcation of water (regional SENAGUA)	MOH district offices	Municipal water offices or public utilities	Rural water community boards or JAAPs		
Responsible of revenue collection from users								X	X		
Responsible for training to communities or JAAPS on O&M	X							X	X		
Who leads community/JAAPS water systems planning?						X		X		X	X*
Who controls that water systems are operational and providing service quality					X	X		X			
Responsible of supervising and monitoring staff or service provider performance?					X	X		X			

Figure A.1: Process and Duration of the Different Stages of Pre-Investment

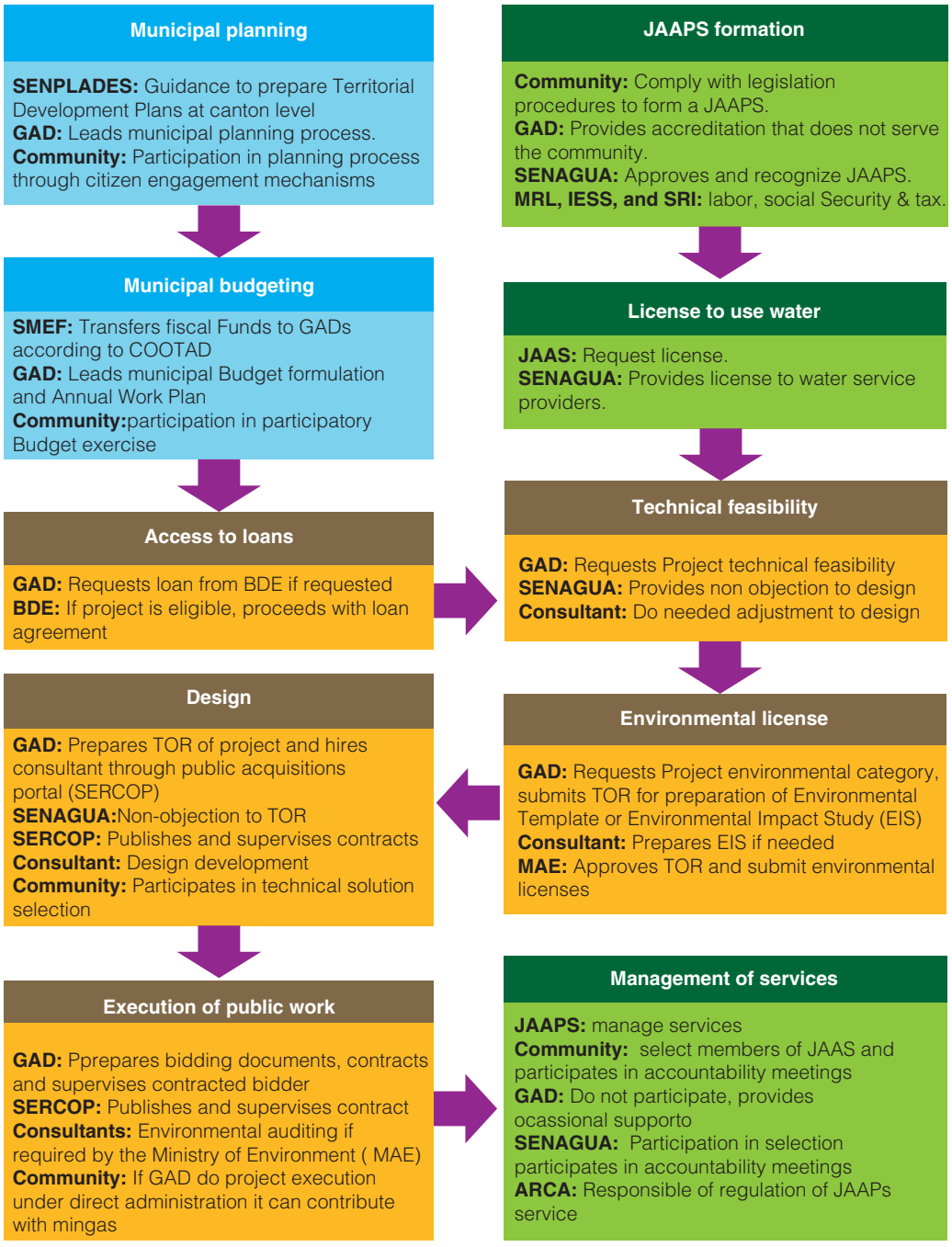

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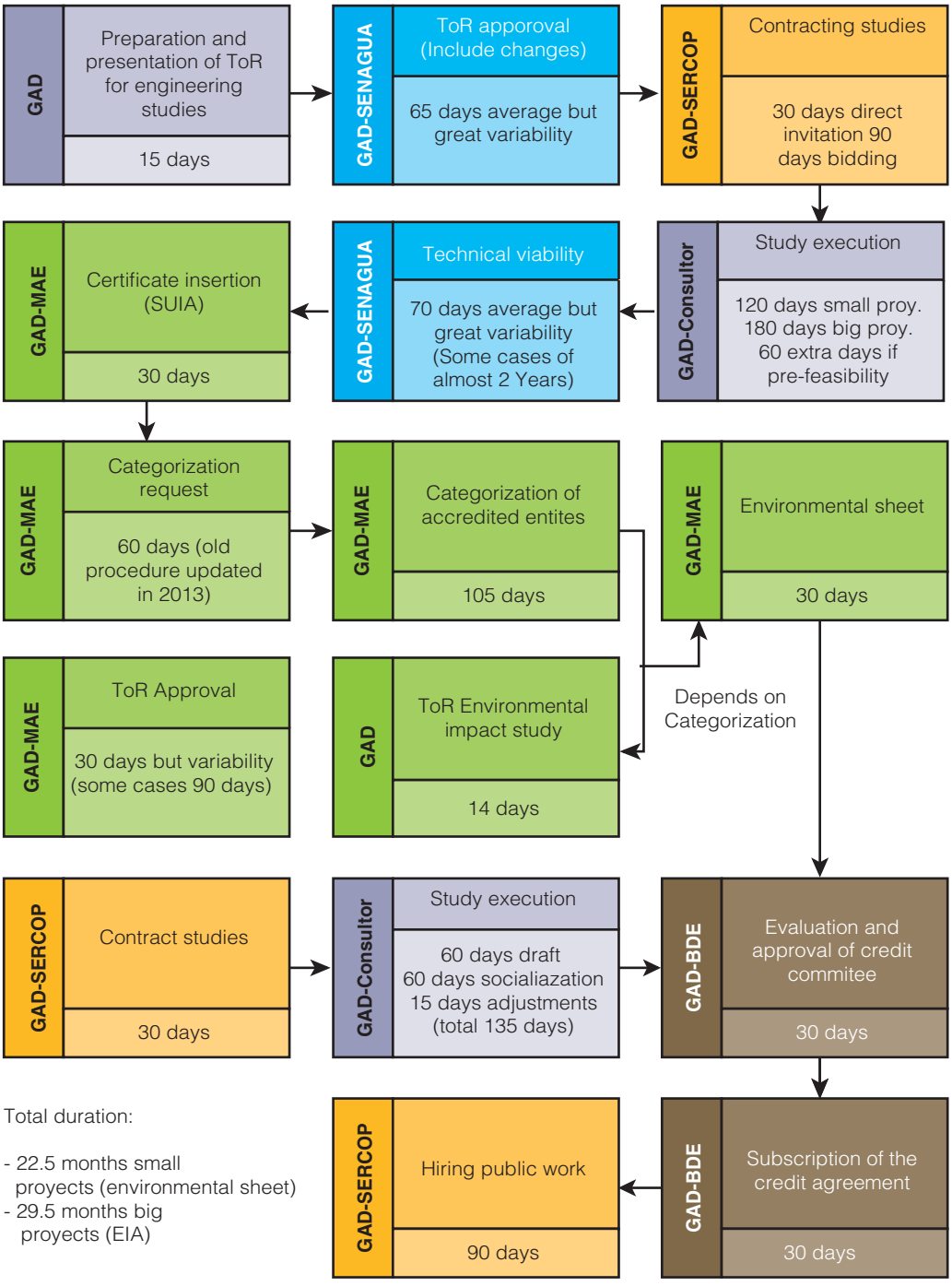
Figure A.1: Continued



Source: ENAS

Table A.2: Factors of Successful Public-Community Partnerships for Selected Cantons

Cities factors	Cañar	Suscal	Rio verde	Quinindé	Lago agrio	F. de orellana
Specific municipal structure	There are specific autonomous urban/ rural structures for service provision	It does not exist, it is managed from MTOP.	The organization is incorporated formally.	There is management of drinking water for urban and rural areas	There is a specific structure. There is an organization in place for urban areas.	There is management of drinking water for urban and rural areas
Budget, investment criteria, participatory budget	It has criteria to guide investments towards basic services	It does not have formal criteria	It does not have formal criteria	It does not have formal criteria. The Mayor promotes water investments.	It does not have formal criteria	It does not have formal criteria. Mayor promotes water investments
Human resources for the sector	It has a specific team for differentiated urban and rural service provision	It does not have a specific team	It has specific limited staff focused on urban areas	It has a team for urban and rural areas	It has a team for urban areas	It has a team for urban and rural areas
Inventory or cadastre of the rural sector	It has detailed information on rural water systems	It has information on rural systems	It has information on rural systems	It has partial information of systems	It does not have information on systems	It has partial information of systems
Local regulation for APC	It has ordinance in place for functioning within CENAGRAP	Not available	Incorporated organization for the whole canton	Not available. Documents on organizational structure confirm there is management for urban and rural areas.	Incorporated organization for the whole canton. It only assumes urban areas.	Not available. Documents on organizational structure confirm there is management for urban and rural areas.
Formal space for the coordination and articulation between GAD and JAAP	Formal space of the Board of directors of CENAGRAP	Not available	Not available	Informal team working space	Not available	Informal team working space

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Table A.2: Continued

Cities factors	Cañar	Suscal	Rio verde	Quinindé	Lago agrio	F. de orellana
Organization of the community sector at the local level	There is a cantonal assembly of JAAPs that meets twice a year	It does not exist.	Designated cantonal assembly of JAAPs	It does not exist.	Triprovince consortium of the JAAP	Triprovince consortium of the JAAP
Implementation mechanisms of public works with community participation	It conducts investments via direct management with communities as the counterpart	Investments by contract	Investments by contract	Investments by contract and direct management	Investments by contract	Investments by contract and direct management
Experience with procurement and public purchases	Specific entity within the municipality with experience	It does not have an entity. There is a responsible person, w/o experience.	Finance Department. Basic experience.	Specific Department. It has experience.	Specific entity. It has experience.	Responsible entity has experience
Local second-tier organization of farmers or of indigenous people	There is an organization of second degree in line with the mayor regarding cantonal coverage	There are two organizations of second degree, one in line and one opposed	There are organizations without cantonal presence	Non-existent	There are organizations without cantonal presence	There are organizations without cantonal presence
Service supply for the cantons and in support of the JAAP	Provision of technical training, capacity, advisory services, laboratory	Provision of specific training	Non-existent	Provision of training, follow-up, damage repair	No supply	Provision of training, advisory services, damage repair, water quality analysis

Note: CENAGRAP = Center for the Rural Management of Drinking Water (Centro de Apoyo a la Gestión Rural de Agua Potable). GAD = autonomous decentralized government. JAAP = Junta Administradora de Agua Potable. MTOP = Ministry of Transport and Public Works (Ministerio de Transporte y Obras Públicas).