

F I E L D R E P O R T

PN ABN-814 81801

PLANNING FOR WATER
AND SANITATION PROGRAMS
IN THE ANDEAN REGION: 1991 UPDATE

Field Report No. 336
February 1993

**WATER AND
SANITATION for
HEALTH
PROJECT**

Sponsored by the U.S. Agency for International Development
Operated by CDM and Associates

WASH Field Report No. 336

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AND SANITATION PROGRAMS
IN THE ANDEAN REGION: 1991 UPDATE**

Prepared for the Bureau for Latin America and the Caribbean,
U.S. Agency for International Development
under WASH Task No. 219

by

Michelle Mendez

February 1993

Water and Sanitation for Health Project
Contract No. DPE-5973-Z-00-8081-00, Project No. 936-5973
is sponsored by the Office of Health, Bureau for Research and Development
U.S. Agency for International Development
Washington, DC 20523

RELATED WASH REPORTS

Planning for Water and Sanitation Programs in the Caribbean. Field Report No. 335, February 1992.

Planning for Water and Sanitation Programs in Central America. Field Report No. 334, August 1991.

Planning for Central America Water and Sanitation Programs. Field Report No. 301, June 1990.

Planning for Water and Sanitation Programs in Bolivia, Ecuador, and Peru. Field Report No. 302, June 1990.

Planning for Water and Sanitation Programs in the Caribbean. Field Report No. 303, June 1990.

Planning for Central America Water Supply and Sanitation Programs: Update. Field Report No. 253, May 1989.

LAC Bureau: Planning for Central America Water Supply and Sanitation Programs. Field Report No. 209, May 1987.

Water and Sanitation Sector Profiles of Twenty African Countries. Field Report No. 291, June 1989.

Water Supply and Sanitation in the Health Sector of the Asia Region: Information Needs and Program Priorities. Technical Report No. 36, February 1986.

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ACRONYMS

A.I.D.	U.S. Agency for International Development/Washington
CARE	An international private voluntary organization
CIDA	Canadian International Development Agency
EEC	European Economic Community
GDP	gross domestic product
GNP	gross national product
GOB	Government of Bolivia
GOE	Government of Ecuador
GOP	Government of Peru
GTZ	German Agency for Technical Cooperation
IDB	Inter-American Development Bank
IDWSSD	International Drinking Water Supply and Sanitation Decade (1981-90)
JICA	Japanese International Cooperation Agency
KfW	Reconstruction Loan Corporation (Federal Republic of Germany)
LAC	Bureau for Latin America and the Caribbean (A.I.D.)
MOH	Ministry of Health
NGO	Nongovernmental organization
PAHO	Pan American Health Organization (unit of World Health Organization)
PVO	Private voluntary organization
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund

USAID **U.S. Agency for International Development/overseas missions**

WASH **Water and Sanitation for Health Project**

ACKNOWLEDGMENTS

This report was written by Michelle Mendez of the International Science and Technology Institute, Inc. (ISTI), a member of the WASH Consortium, under the direction of Eduardo Perez, WASH Associate Director for Engineering. Additional guidance and support were provided by J. Ellis Turner, WASH Project Director.

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PREFACE

CHOLERA AND THE WATER AND SANITATION SECTOR IN LATIN AMERICA

The cholera epidemic in this hemisphere represents a public health risk for the Latin American region and a challenge to USAID missions in the region. The lack of safe water and basic sanitation documented in this study makes it very likely that cholera will become endemic throughout Latin America.

The control of the spread of cholera and its ultimate reduction and elimination will occur only with the improvement of environmental health conditions. Specific areas that need to be assessed, improved, and monitored are water quality, water quantity, waste management, and hygiene behavior. Most critical for Latin America is the need to develop and implement strategies for extending low-cost, appropriate sanitation coverage. Similarly, increased efforts to improve health education and hygiene behavior are crucial. Wastewater treatment, while essential to the long-term control of cholera and other waterborne diseases, should be selectively implemented—in the high-impact areas—because of its relatively high cost vs. the financial condition of most Latin American countries.

Cholera is bringing increased attention to the need to improve water supply and sanitation services in Latin America. There is an exceptional opportunity for the sector to attract investments in new and rehabilitated infrastructure. But the improvements that are needed will not be achieved simply by pouring more money into the sector. Current information—particularly from the recent assessment of a collaborative program for Latin America—indicates that the present capacity of the sector to absorb and effectively use financial and human resources is limited. Building that capacity will require well-focused technical assistance, not only to develop institutional and human resources, but also to address fundamental weaknesses in sector organization and policies. A well-organized sector with a sound policy framework would then enable effective use of investment funds and ensure the coordination of the efforts of governments, NGOs, the private sector, and external support agencies.

EXECUTIVE SUMMARY

This report is the first update of a Water and Sanitation for Health (WASH) study of the water and sanitation sector in three Andean countries prepared for the LAC Bureau of the U.S. Agency for International Development. It covers Bolivia, Ecuador, and Peru. The report assesses the current (through the end of 1990) availability of water supply and sanitation services in the three countries, measures progress toward increased coverage, and analyzes investment commitments to estimate the additional funding needed to meet the proposed targets.

Definitional Framework

The definitional framework employed in this report is the same as that used in the previous studies. Water and sanitation coverage is a tally of the population with access to at least minimal services and is expressed either in terms of numbers of persons or as a percentage of the total estimated population. The following definitions are used:

- Population centers of 2,000 or more are considered urban; all others are rural.
- Water supply coverage includes persons with access through a direct connection or a water system outlet (standpipe or public fountain) within 200 meters of the home. Coverage estimates also count persons serviced by water vendors.
- Sanitation coverage includes those with an in-house or in-compound sewerage connection, septic tank, or latrine.
- Regional coverage refers to the group of three countries, not to the Andean region as a whole. This report does not mark distinctions in the quality of service provided. All persons reported to have coverage are considered to have at least minimal access to water and sanitation services as defined above.

Access to Water and Sanitation Services in 1990

In 1990, access to water supplies in the region ranged from a low of 55 percent in Bolivia to a high of 66 percent in Ecuador. With 34 percent coverage, Bolivia also provided the lowest access to sanitation services. Ecuador, with 64 percent coverage, also ranked highest in access to sanitation service. Coverage figures for each country are illustrated graphically in Figure 1.

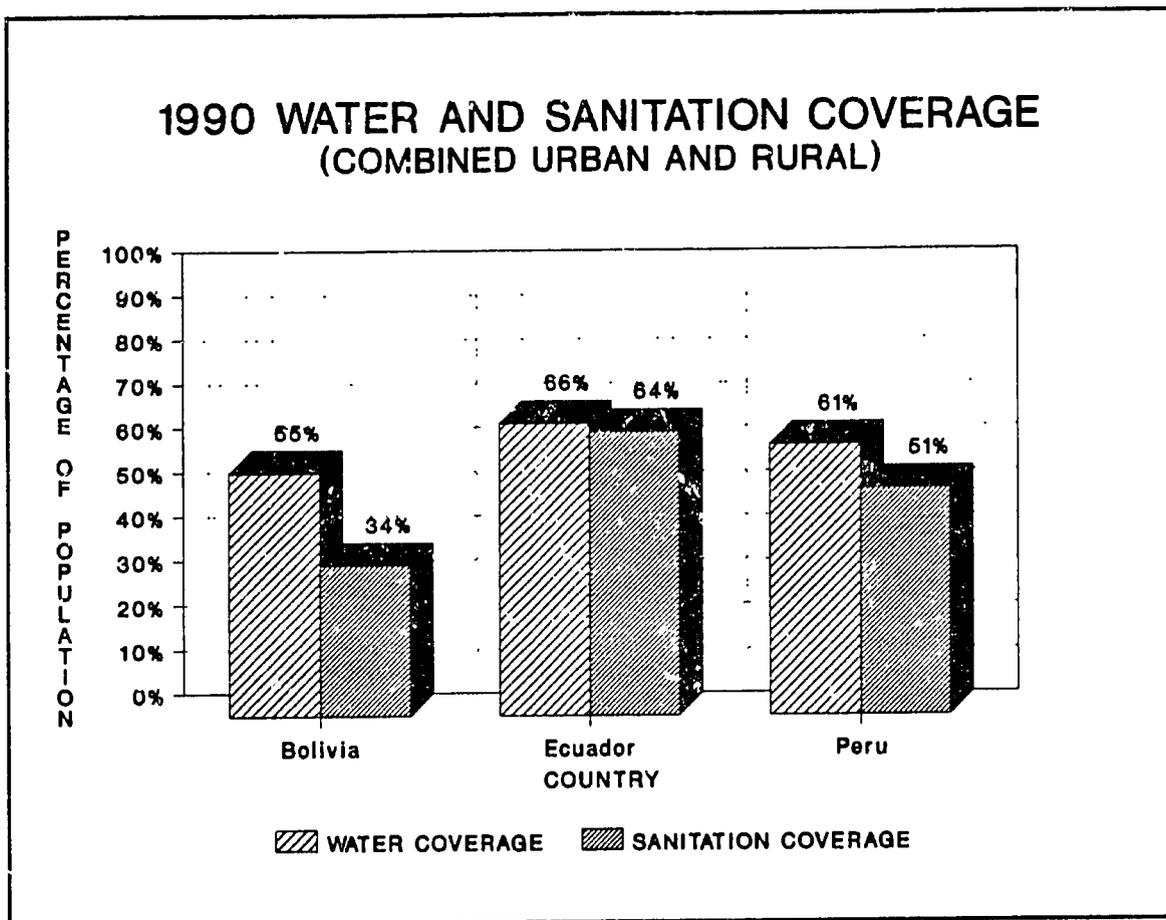


Figure 1

Overall, an estimated 62 percent of the 39 million inhabitants of the three Andean countries had access to water supply services and 51 percent had access to sanitation. Because of escalating urbanization, advances in urban water and sanitation infrastructure have barely kept pace with urban population growth. In 1990, 78 percent of urban residents had adequate water supply access and 66 percent had access to sanitary waste systems. These figures represent gains of 7 percent in water and 8 percent in sanitation since 1980, from 71 percent and 58 percent, respectively. The shifting population has meant that the disparity between urban and rural service has declined substantially. In 1990, only 34 percent of rural dwellers had access to water and 28 percent to sanitation services. Rural water coverage has increased by 17 percent since 1980, while sanitation coverage has advanced by 22 percent. Regional coverage for urban and rural areas in 1980 and 1990 is illustrated in Figure 2.

1995 WASH Targets

The coverage objectives referenced in this report are goals for urban and rural populations in each country with access to water and sanitation facilities. The targets, which are expressed as percentages, are estimates of the progress required by 1995 if full coverage is to be

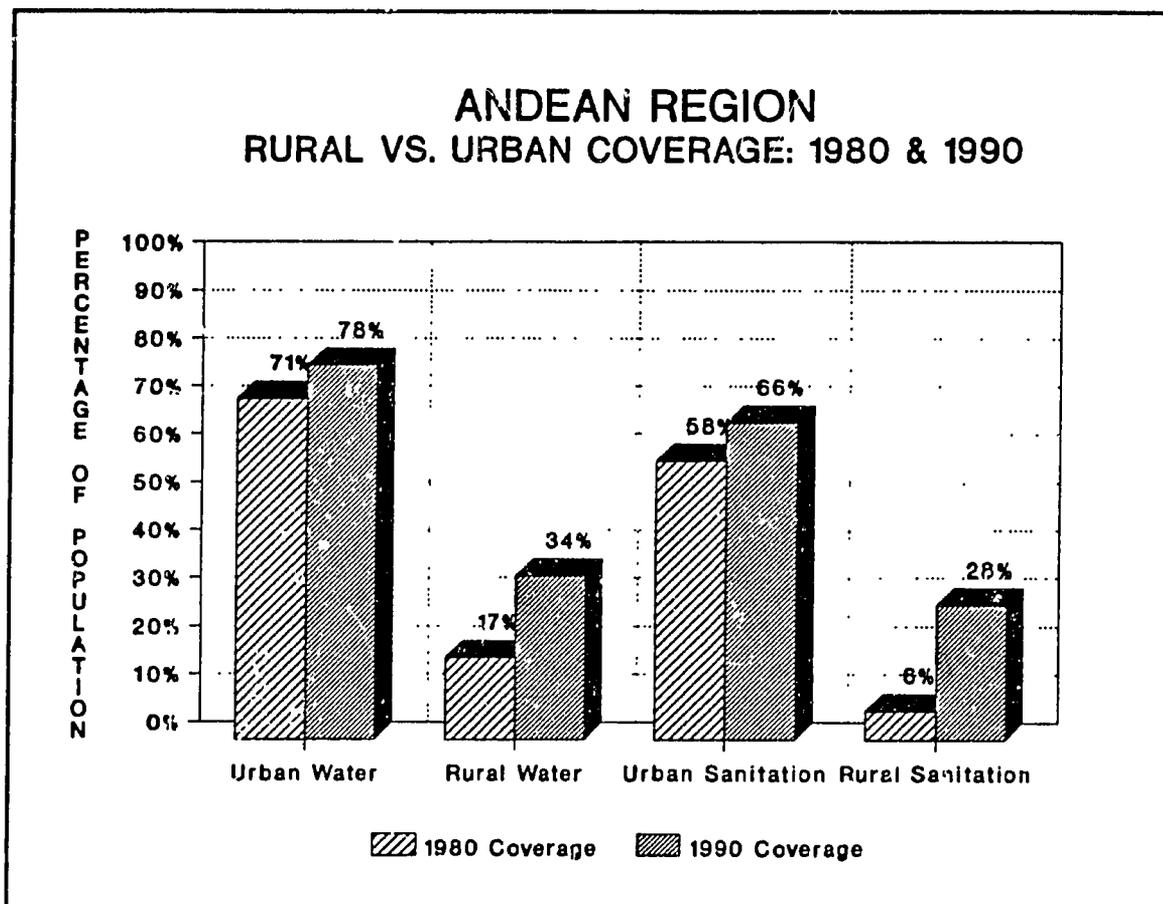


Figure 2

achieved by the year 2020. These goals do not necessarily reflect each country's current development plans for the sector.

The WASH targets seek to raise regional water coverage from 62 percent in 1990 to 70 percent in 1995 and sanitation coverage from 51 percent to 60 percent. A breakdown of 1995 regional water and sanitation targets by rural and urban sectors is shown in Figure 2. Based on current population trends, this means approximately 7.2 million more persons will require access to water and 6.7 million more to sanitation to meet the targets.

Funding Requirements and Shortfalls

Funding to meet the 1995 targets was estimated by multiplying the number of additional persons to receive coverage by per capita costs of providing services in each country. Unit costs are based on figures developed by PAHO.

Table 1

**Funding Requirements and Shortfalls
(1990 US \$000s)**

	WATER SUPPLY			SANITATION			TOTAL
	SUBTOTAL	URBAN	RURAL	SUBTOTAL	URBAN	RURAL	
ESTIMATED FUNDING REQUIRED	\$487,076	388,968	98,108	439,327	338,343	100,984	926,403
CURRENT COMMITMENTS*	\$82,058	64,671	17,387	80,481	67,180	13,301	162,539
DEFICIT	\$405,018	324,298	80,721	358,847	271,164	87,683	763,865

*Includes only those commitments which will expand coverage to meet the wash target levels.

Total funding needed is approximately \$926 million (Table 1). Investments needed in urban water are nearly \$389 million, which, added to an estimated \$98 million for rural water, make a total of \$487 million. Approximately \$439 million is needed in sanitation: \$338 million to meet urban coverage goals and \$101 million for rural areas. The greater cost to meet urban targets is in part a consequence of heavy urbanization throughout the region but also because of cheaper low-technology systems in rural areas.

WASH's estimate of current funding commitments for the region, shown in Table 1, includes those that will extend coverage of water and sanitation service. It excludes support for such areas as rehabilitation and institutional strengthening. Funding shortfalls, also detailed in Table 1, are the difference between current commitments and the total estimated cost to achieve the WASH goals. Only \$162.5 million (18 percent) of the \$926 million required has been committed, leaving a deficit of \$764 million. Deficits by subsector are: \$324 million for urban water; \$80 million for rural water; \$271 million for urban sanitation; and \$87 million for rural sanitation.

Without substantial additional commitments, the three countries will find it impossible to meet the WASH targets. These commitments must approach approximately \$153 million each year over the next five years to eliminate the \$763 million regional deficit.

Peru's 21.6 million inhabitants make up 55 percent of the regional population. A sustained economic crisis and an ongoing civil war have kept its level of investment in water and sanitation development at less than 16 percent of the regional level. It is therefore not surprising that its share of the deficit is 75 percent of the regional total.

WASH's Lessons Learned

Over the past ten years, WASH has learned that the problems go beyond improving access to water and sanitation services. In addition to installing improved facilities, it is important to provide maintenance systems and health and hygiene education, and to address

environmental issues. These Andean nations face a formidable challenge that can best be met by cooperation among the various agencies, institutions, and communities at both the policy and operational levels, and by a long-term commitment to build the systems and the capacity to maintain them.

Chapter 1

INTRODUCTION

1.1 Purpose and Scope

This document is the first of four planned annual updates of a 1989-90 study by the Water and Sanitation for Health (WASH) Project of water and sanitation services and investments in three Andean countries for the LAC Bureau of the U.S. Agency for International Development. The countries are Bolivia, Ecuador, and Peru.

The report provides available data through 1990 on the water and sanitation sector and on populations with access to adequate water and sanitation facilities in the three countries, and estimates the funding required to meet the WASH coverage objectives for 1995 established in the original study. It contains brief descriptions of ongoing and planned contributions by other donor agencies and, based on current and planned donor funding, estimates the additional investments needed to enable each country to meet the target coverage levels.

1.2 Sources

USAID missions in Bolivia, Ecuador, and Peru, and A.I.D.'s Regional Housing and Urban Development Office/Ecuador provided current data on water and sanitation coverage and programs. Other institutions that provided information are CARE, the Canadian International Development Agency (CIDA), the German Agency for Technical Cooperation (GTZ), the German Reconstruction Loan Company (KfW), the Inter-American Development Bank (IDB), the Pan American Health Organization (PAHO), the United Nations Children's Fund (UNICEF), and the World Bank.

1.3 Definitional Framework

The definitional framework employed in this report is the same as that used in the previous studies and is explained below.

1.3.1 Coverage Data

Water and sanitation coverage is a tally of the population with access to at least minimal services and is expressed either in terms of numbers of persons or as a percentage of the total population. Coverage estimates are enumerated for the four subsectors in each country, namely, urban water, urban sanitation, rural water, and rural sanitation. The following definitions are used:

Urban and Rural Populations—Population centers of 2,000 or more are considered to be urban; all other areas are rural.

Water Supply Coverage—Water supply coverage includes persons with access through a direct connection or from a water system outlet (standpipe or public fountain) within 200 meters of the home.

Sanitation Coverage—Sanitation coverage includes service provided by an in-house or in-compound sewerage connection, septic tank, or latrine.

Regional Coverage—References to regional coverage apply to the three countries alone, not to the region as a whole.

The report takes no account of quality, which varies greatly with the different types of service provided (e.g., direct house connections versus communal standpipes) and frequently varies among population centers. For example, as a result of shortages some cities have piped public water supplies for only a few hours a day, while others have continuous service. It is not possible to make such distinctions in quality in this report; all persons reported to have coverage are considered to have at least minimal access to water and sanitation services as defined above.

It is important to note, however, that some facilities are inadequate from environmental or health standpoints and clearly require upgrading and improvements. As a result, statistics may exaggerate the number of persons with adequate coverage. Throughout the region, particularly in rural areas, many populations have access only to rudimentary facilities, such as poorly constructed latrines and gravity-fed systems that supply untreated water. Many urban population centers receive piped water supplies that do not measure up to standards for potable water in industrialized nations. In many areas, water and soil pollution from pesticides poses a threat to human health. Water quality suffers as a result of poor regulatory systems and the lack of enforcement capability, as well as from the lack of resources to install and maintain improved facilities.

In addition to the danger posed directly to consumers, water and sanitation systems in these countries often pose a long-term threat to the environment. Untreated domestic and industrial wastewater is dumped into rivers and other bodies of water. There is widespread dumping of solid waste in open-cut dumps and on uncultivated land when volumes exceed the capacity of public collection and disposal systems. Human excreta contaminate soil and groundwater in areas where latrines are not water-sealed or are under-utilized. Although they are beyond the scope of this report, environmental and health issues clearly must be given priority in developing water and sanitation facilities in the region.

Coverage data in some instances are based upon assumptions that differ from the definitional framework for this report. Consequently, WASH has had to use its best judgment to bring the

data into conformity with the definitions outlined above. These adjustments are described in the country profile appendices.

1.3.2 Excluded Funds

Only expenditures for projects that expand the number of persons with access to water and sanitation services are included in the investment analysis. Consequently, funding for a number of projects, particularly some of the large loans made by the IDB and the World Bank, have not been included in their entirety. Many of these loan programs support the rehabilitation or upgrading of existing systems or the construction of off-site facilities (indirect-user facilities such as treatment plants, dams, reservoirs) to improve or sustain existing services. Frequently, these projects do support some system expansion. Therefore, as in the 1990 study, 10 percent of the estimated outstanding disbursements has been considered as funding which supports the extension of coverage.

Non-infrastructure projects, which support activities such as institutional development of water and sewerage agencies, management education, operation and maintenance training, technology transfer, and health and sanitation education, are also excluded from the funding analysis. These projects, though an essential component of efforts to augment water and sanitation services, do not directly provide for service expansion. Nonetheless, WASH recognizes that technical assistance and rehabilitation efforts are crucial for the efficient, sustained development of water and sanitation resources. Technical assistance in improving financial accounting and cost recovery from users, for example, has made it possible for the Quito municipal water company to provide more affordable residential connections to more than 25,000 low-income families over the last two years. Without investments in rehabilitation, efforts to expand coverage to previously unserved populations would be undermined by the deterioration of services in other areas. While this report focuses only on investments which directly lead to expanded coverage, investments in technical assistance, rehabilitation, and upgrading also contribute in important ways to the expansion of water and sanitation services.

Funding already expended on ongoing projects has also been excluded from the investment analysis. Where detailed information on disbursement schedules was not readily available, WASH has estimated remaining expenditures on the basis of the best available information.

1.3.3 The 1995 Targets

WASH targets for urban and rural water and sanitation coverage to be attained by 1995, developed in the 1990 study, were extrapolated from a model that projects full coverage in each subsector of each country by the year 2020. While percentage goals remain the same, the numbers of additional persons to be served to meet the targets have changed slightly as a result of population growth and advances in coverage made over the past year.

The WASH targets were not developed with country participation and do not reflect specific country goals. They are intended to assist A.I.D. in tracking the progress in water and sanitation service expansion, and focus attention on the magnitude of investment needed for raising coverage levels in these countries.

1.4 Methodology

The methodology to determine the funding needed to achieve the 1995 targets is the same as for updates of other LAC regions.

- Using information from the USAID mission in each country, the report updates data on coverage for the four subsectors through the end of 1990.
- The total number of persons targeted for coverage in each subsector in 1995 is calculated by estimating the 1995 population through a simple linear extrapolation (i.e., by increasing the existing population at the current growth rate for a five-year period). The percentage goal for 1995 is then multiplied by the projected population to determine the size of the target population.
- The number of persons with access to services in each subsector in 1990 is then deducted from the number targeted for coverage in 1995 to provide an estimate of the additional population requiring water and sanitation services. For each subsector, the population target is then multiplied by the average unit cost to estimate the total investment needed to attain WASH's objective.
- Finally, the funding shortfall is calculated by subtracting the total commitments for coverage-expanding projects in each subsector from the total investment needed to attain WASH's targets.

1.5 Report Organization

Chapter 2 of this report presents population and coverage data for the region and for each of the three countries. It also discusses progress toward attaining the 1995 WASH targets, foreign assistance commitments in each subsector, and funding shortfalls. Chapter 3 discusses the prospects for attaining these goals in each country and in the region. The country profile appendices that follow provide a more detailed analysis of the water and sanitation sector in each country. Each appendix contains tables and figures documenting actual water supply and sanitation coverage and the estimated investment required to meet the 1995 targets.

1.6 Additional Planning Reports

The LAC Bureau plans to continue its periodic updates of this Andean region study through 1994. Reports on water and sanitation in the Caribbean countries of Barbados, the Dominican Republic, Grenada, Haiti, and Jamaica, as well as for Central America and Panama, are also available. These two regional reports will also be updated periodically through 1994.

Chapter 2

WATER SUPPLY AND SANITATION UPDATE

2.1 Introduction

The coverage statistics provided in this report present a reasonably accurate picture of services available in each of the three Andean countries. Much of the information was obtained directly from national sources—water and sewerage agencies, coordinating committees, and census bureaus. In those instances where the reported coverage or population figures were not in conformity with the definitional framework of this report, WASH made adjustments using its best judgment. These adjustments are explained in the country profile appendices.

It is likely that the data slightly exaggerate the number of persons with coverage. Water and sanitation coverage estimates are usually developed by adding estimates of new facilities (connections to public systems and newly constructed wells, latrines, and other individual/private facilities) to data collected in a survey or census, and may include facilities not fully used as well as facilities that have fallen into disrepair. Occasionally, estimates may include planned connections to public systems that have not been made. Despite these shortcomings, WASH feels that the data accurately reflect existing coverage and historical trends.

In comparing this update with the 1990 study, it should be noted that estimates of historical coverage for Bolivia have been revised to incorporate updated information. As a result, 1989 data for the Andean region differ slightly from those reported earlier.

2.2 Access to Water and Sanitation Services in 1990

According to 1990 estimates, less than two-thirds of the 39 million inhabitants of the region have adequate access to water supplies and just over half have sanitation services. Access to water has increased by 2 percent since 1989, to reach 62 percent of the population, with the provision of services to one million new users. Sanitation coverage, which stood at 51 percent in 1990, rose by 5 percent over the previous year and included 2.1 million new users. Despite these gains, 15.1 million people in the three countries lack adequate access to water and 19.1 million are without basic sanitation services.

As in previous years, Ecuador maintains the highest coverage levels: 66 percent for water and 64 percent for sanitation. Bolivia, with 55 percent water coverage and 34 percent sanitation coverage, has the largest proportion of persons without service. Together, these countries have 6.8 million residents without water service and 8.4 million without sanitation. Peru, with 8.3 million residents without adequate water supply access and 10.7 million without sanitation

service, faces the most critical shortages, though coverage is 61 percent and 51 percent for water and sanitation, respectively. Current coverage figures for each country are provided in Tables 1 and 2, and are illustrated in Figure 1.

2.2.1 Urban vs. Rural Access

In 1990, 78 percent (19.1 million) of the region's 24.5 million urban population had adequate water service, compared with only 34 percent (5 million) of the region's 14.8 million rural dwellers (Table 1, 1990 figs). Sanitation services, available to 66 percent (16.1 million) of urban dwellers, reached only 28 percent (4.1 million) of the rural population (Table 2, 1990 figs).

The disparity between urban and rural coverage is illustrated in Figure 2. Though this disparity remains extreme, it is declining as a result of rapid urbanization. From 1989 to 1990, 532,000 new urban users received drinking water services, and 467,000 rural residents were served. At the same time, the regional urban population grew by 955,000 and the rural population *declined* by 583,000. Thus, while the proportion of the urban population with water supply service declined by one point to 78 percent, rural coverage increased by four points, from 30 to 34 percent.

Similarly, in sanitation, both rural and urban coverage increased by 5 percent from 1989 to 1990. While service became available to 1.7 million urban dwellers, however, only 475,000 rural dwellers gained access to sanitary systems for excreta disposal.

Despite substantial gains in the number of people served, as a result of urbanization regional coverage in urban water has increased by only 7 percent (from 71 to 78 percent) since 1980, while rural water coverage has advanced from 17 to 34 percent. Thus the gap between urban and rural coverage has declined from 54 points to 44 points. Over the decade, urban sanitation coverage has increased by only eight points, from 58 percent in 1980 to 66 percent in 1990¹. Meanwhile, rural coverage grew from 6 to 28 percent, narrowing the disparity in coverage from 52 to 38 points (see Figure 3).

Urban coverage has not been able to keep pace with the population growth. During the 11-year period, nearly 7.4 million urban residents gained access to water services and 6.5 million to sanitation, compared with 2.7 and 3.2 million rural inhabitants, respectively. However, while the urban population has increased by 8 million since 1986, the number of rural inhabitants has grown by only 743,000.

¹ Sharp increases in coverage are usually the result of the completion of a new system and the addition of a large number of new users. In this case, however, it may be the result of revised estimates.

2.2.2 Water vs. Sanitation Advances

As indicated by these trends, gains in sanitation services have lagged behind gains in access to safe water. Since 1980, overall sanitation services have expanded to reach an additional 9.7 million users, while water services now reach an additional 10.1 million. More recently, however, sanitation service development appears to be gaining momentum; coverage increases between 1989 and 1990 have been far greater than water supply advances. A total of 2.14 million (1,666,000 urban and 475,000 rural residents) gained access to sanitation services in the past year, while 1 million individuals (467,000 rural and 532,000 urban residents) gained access to adequate drinking water supplies. This new impetus is in part a reflection of latrine-building projects, as well as an acceleration in connections to public sewerage systems.

2.2.3 Access by Country

Figures 4 and 5 compare water and sanitation coverage by country for 1980 and 1990. Coverage in the three countries has been very similar. This is particularly true of the water sector. Current water supply coverage (1990) ranges from 55 percent in Bolivia to 66 percent in Ecuador, a relatively small span. Sanitation coverage varies more widely, ranging from 34 percent in Bolivia to 64 percent in Ecuador. The figures also illustrate the similarity in the development of water and sanitation infrastructure in the three nations. Between 1980 and 1990, water coverage increased by 18 percent in Bolivia and Ecuador and by 13 percent in Peru. During the same time, sanitation coverage advanced by 16 percent in Bolivia and Peru and by 21 percent in Ecuador.

2.3 1995 WASH Targets

WASH targets are percentage goals for access to water and sanitation facilities among urban and rural populations in each country and will be affected by population growth and advances in coverage. They are estimates of the progress required by 1995 for full coverage to be achieved by the year 2020 and do not necessarily reflect each country's current development plans for the sector.

The targets for each country and for the region are shown in Tables 3 and 4, which compare 1990 coverage with the coverage necessary to meet the 1995 targets for each subsector—in both percentages and numbers of persons to be served. Figures 6 and 7 show this comparison graphically. Regional targets for water coverage (Table 3) are now 84 percent for urban areas and 45 percent for rural populations, or an overall goal of 70 percent. The corresponding sanitation goals (Table 4) are 40 percent for rural areas, 71 percent for urban areas, and 60 percent for both population groups.

These targets seek to raise regional water coverage by 8 percent and sanitation coverage by 9 percent. Based on current population growth trends in each country, approximately 7.2

million additional persons will require access to safe water and 6.7 million to sanitation. The numbers of additional persons to be served in each country and in the region are shown in Table 5. Peru, the most populous of the three countries, will require the largest number of new facilities and connections to meet the WASH goals. Peru must provide water connections for 4.34 million persons and sanitation facilities for 3.76 million by 1995 to meet the targets.

2.4 Funding Requirements

The levels of funding to meet the 1995 targets were determined by multiplying the estimated number of additional persons to be covered in each subsector in each country (Table 5) by the unit costs of providing services¹ and are shown in Table 6. Investment requirements for the region are shown graphically in Figure 8.

Overall, \$926 million must be committed to water and sanitation development to attain WASH's targets. Urban water will require nearly \$324 million and rural water about \$81 million, for a total of \$405 million. A slightly smaller commitment of \$359 million is needed in sanitation, with \$271 million for urban and \$88 million for rural areas.

The disparity in costs to meet the urban and rural targets (\$595 million versus \$169 million) is, in part, a consequence of heavy urbanization throughout the region but also a result of differences in unit costs. At average rates of \$75 and \$77 per capita, respectively, the cost of extending urban water and sanitation services is significantly greater than the cost of expanding rural services (\$46 and \$45 per capita, respectively). Urban sewerage systems and in-house water lines are more expensive than low-cost, simple technology systems (such as latrines and wells fitted with hand-pumps) in rural areas.

2.5 Funding Commitments and Shortfalls

WASH's estimates of funding committed to expand water and sanitation coverage in the region are provided in Table 6. They include external investments and some national funding (primarily counterpart monies for donor-assisted projects) and also a portion of the financing for projects which contribute only partially to service expansion. A breakdown by donor of the total current commitment of approximately \$163 million is provided below. It combines national counterpart funding with donor funding linked to particular projects.

¹ Costs are based on figures developed by PAHO. They are expressed in U.S. dollars, have been increased by a small factor each year to account for inflation, and have been increased by 5 percent over figures used last year. Unit costs for each country are shown in Table 3 in the country profile appendices.

A.I.D.	\$22,200,000
CARE	\$5,313,000
CIDA	\$5,800,000
France	\$8,965,000
GOE(World Bank Matching)	\$24,000,000
Germany	\$3,800,000
IDB	\$37,400,000
Italian Government	\$0
KfW	\$0
Peru	\$167,000
SSID	\$0
UN	\$5,025,000
UNICEF	\$768,000
World Bank	\$49,100,000
Total	\$162,538,000

External support agencies and governments are vital sources of financing. The World Bank, the KfW, the IDB, and A.I.D. have been major supporters of projects to expand services to populations currently lacking access to minimal water and sanitation facilities. Since the figures above do not include funding for activities that do not expand coverage, they do not reflect the substantial support from the IDB and the World Bank for the upgrading and rehabilitation of large municipal systems. Funding for such efforts is critical for maintaining and improving existing systems and for ensuring that services to densely populated urban areas do not deteriorate.

The additional investment to meet the 1995 regional targets in each subsector was calculated by deducting total committed investments from total estimated costs (Figure 8).

Approximately \$926 million is needed to bring regional water and sanitation access to the prescribed levels in 1995 (Table 6). Only about 17.5 percent (\$162 million) of this amount has been committed, 18 percent of the funding needed for urban areas and 15 percent of the funding for rural zones committed. There is an overall shortfall of \$764 million, which will require an average of nearly \$153 million in additional annual commitments.

Investment shortfalls in the four subsectors are as follows: \$324 million for urban water; \$271 million for urban sanitation; \$81 million for rural water; and \$88 million for rural sanitation. Because of Peru's relatively large population, more than 70 percent of the total deficit (\$543 million) is needed for that country alone. Funding shortfalls for each country are presented in Figure 9.

1990 WATER AND SANITATION COVERAGE (COMBINED URBAN AND RURAL)

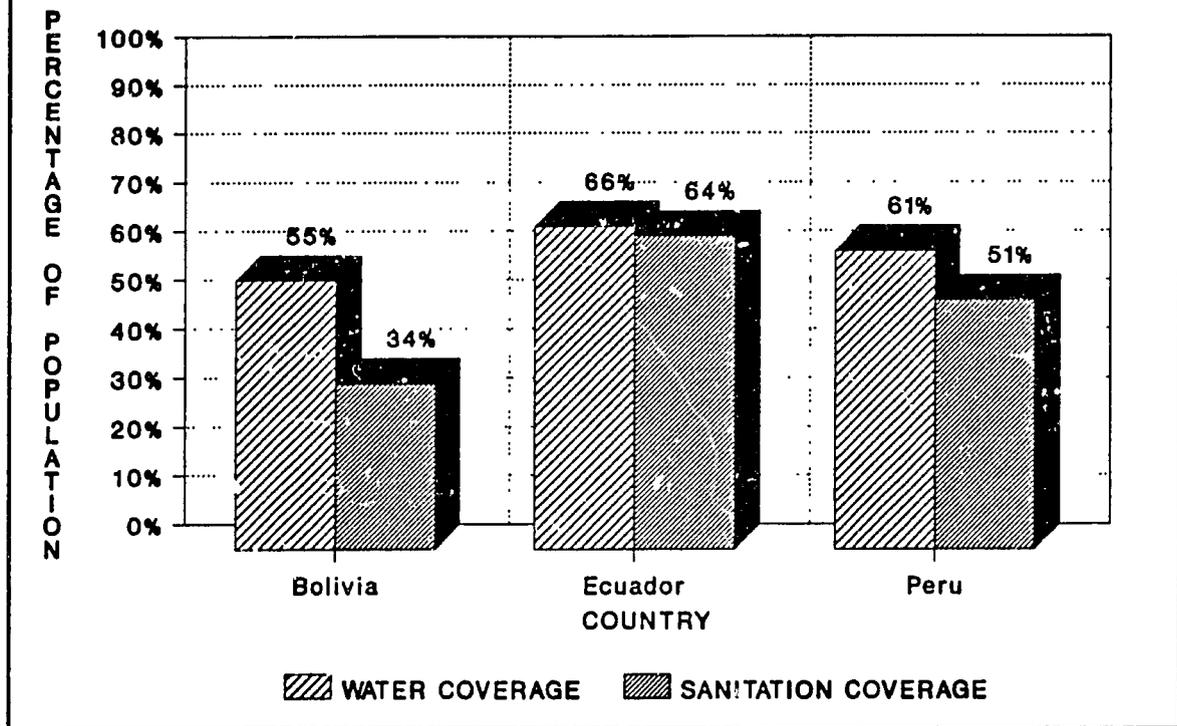


Figure 1

ANDEAN REGION 1990 REGIONAL COVERAGE

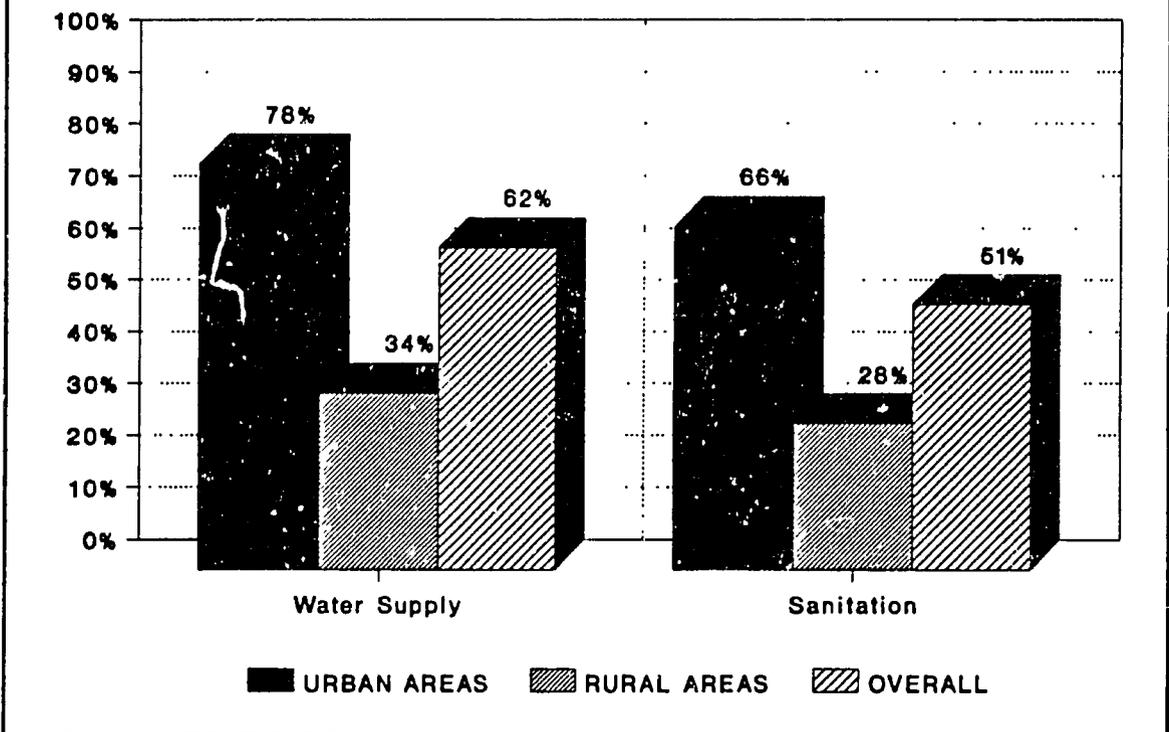


Figure 2

ANDEAN REGION RURAL VS. URBAN COVERAGE: 1980 & 1990

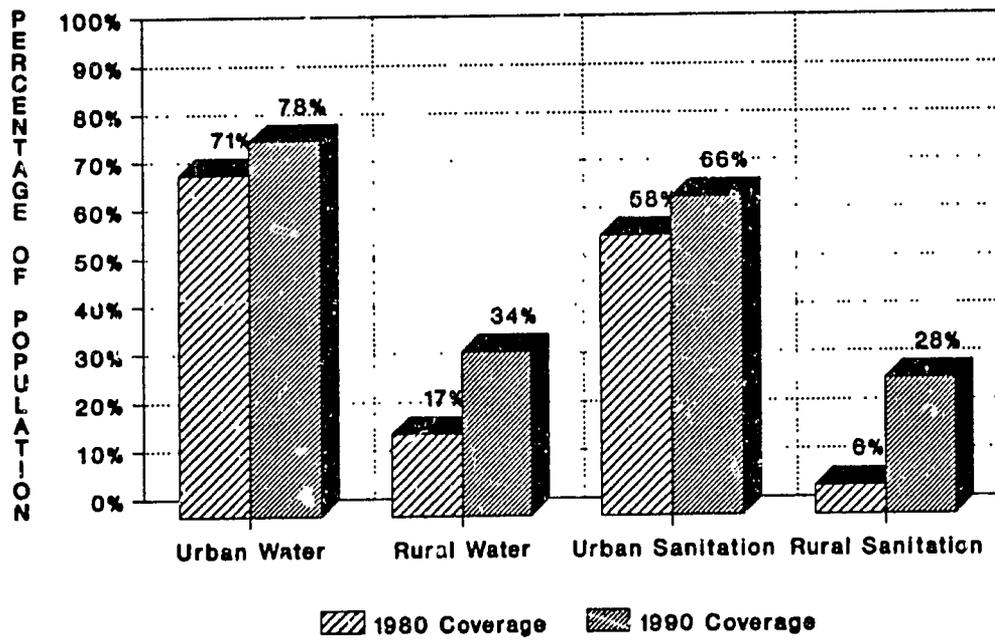


Figure 3

1980 & 1990 WATER SUPPLY COVERAGE (COMBINED URBAN AND RURAL)

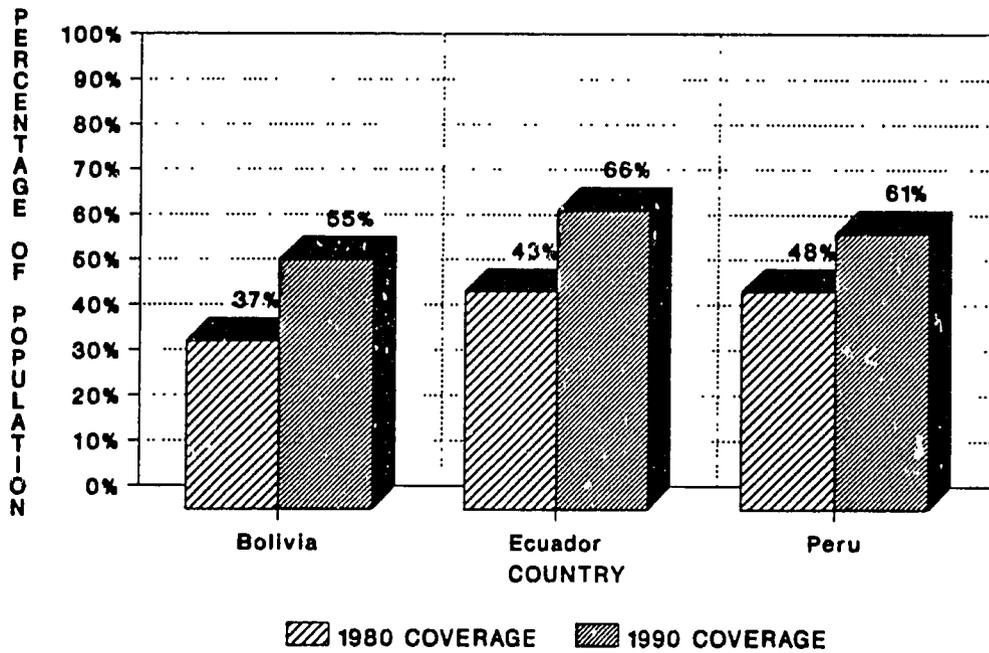


Figure 4

1980 & 1990 SANITATION COVERAGE (COMBINED URBAN AND RURAL)

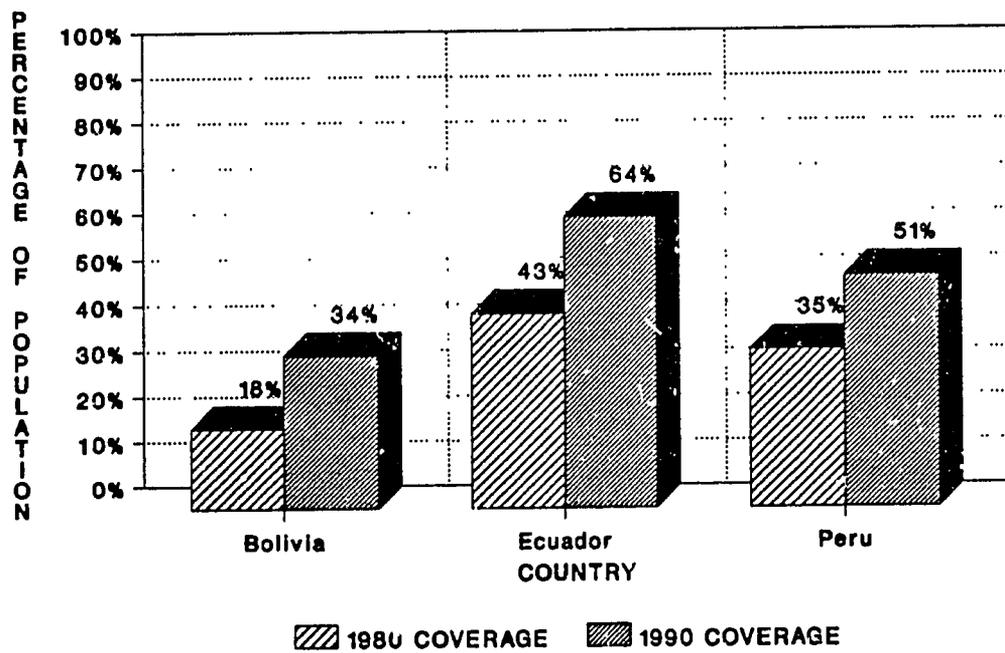


Figure 5

1990 WATER COVERAGE VS. TARGETS (COMBINED URBAN AND RURAL)

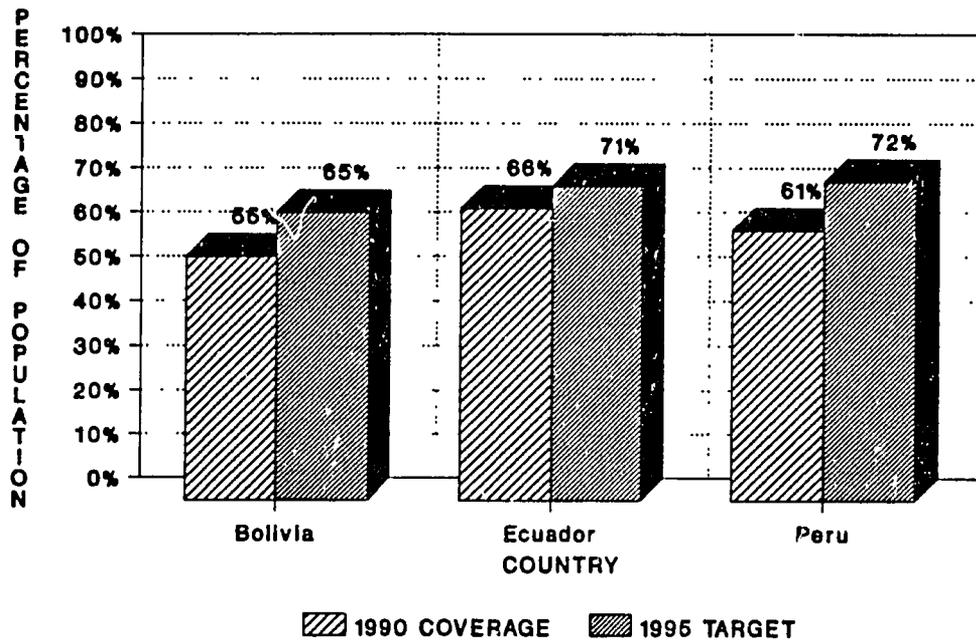


Figure 6

1990 SANITATION COVERAGE VS. TARGETS (COMBINED URBAN AND RURAL)

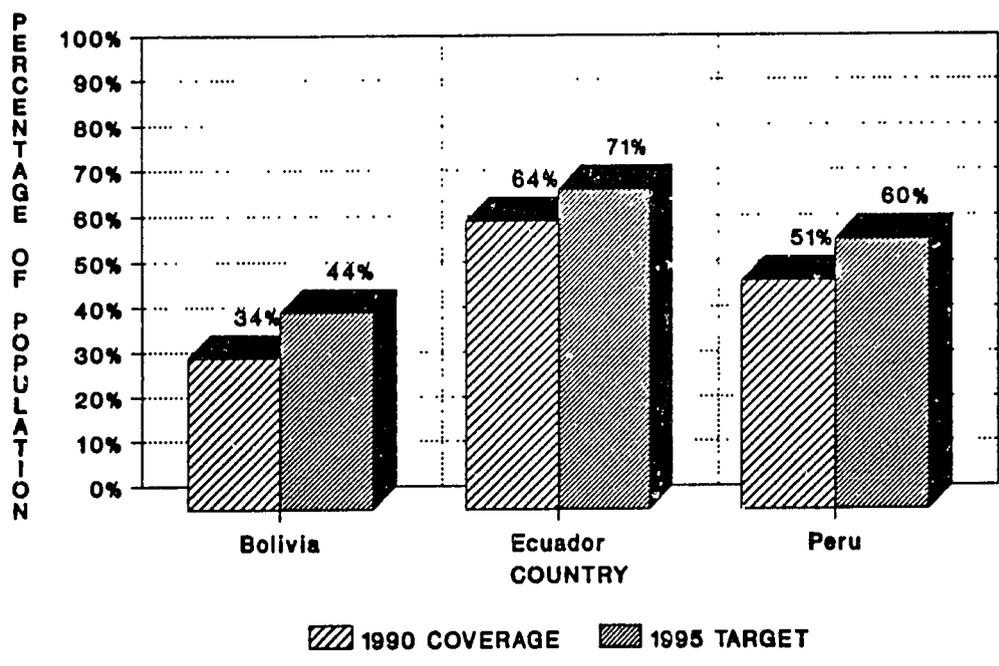


Figure 7

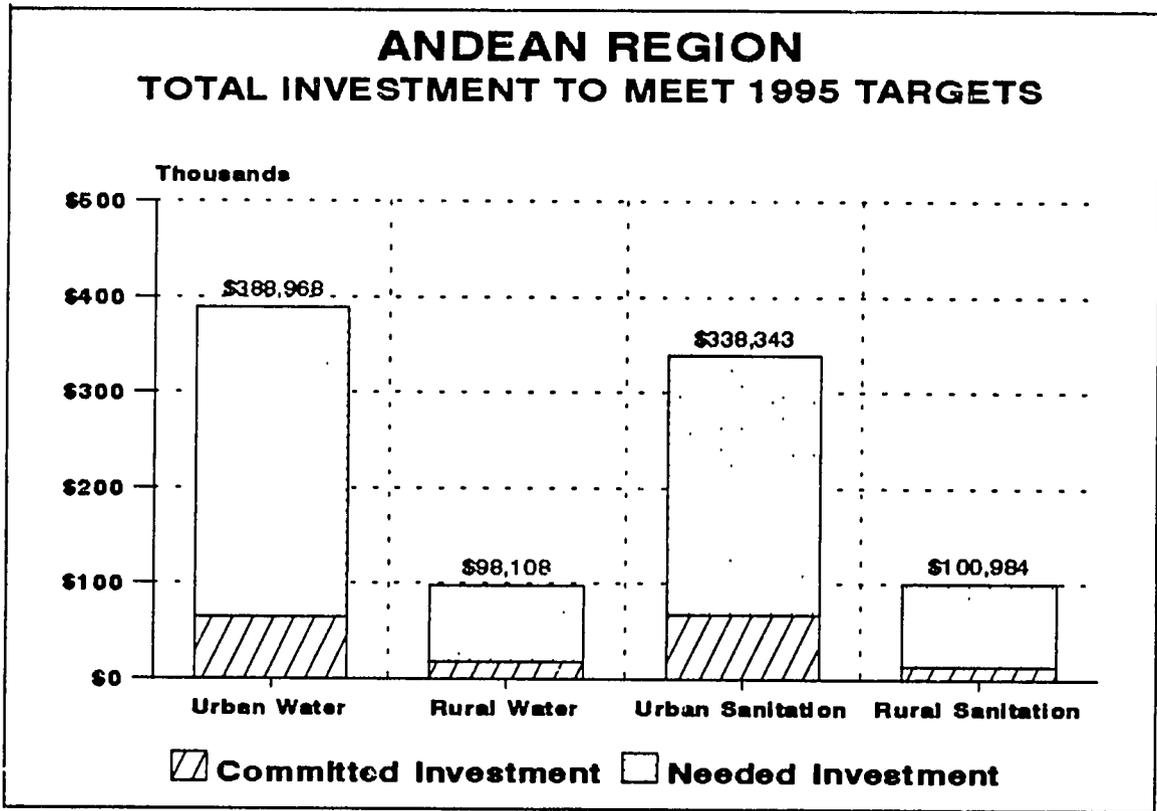


Figure 8

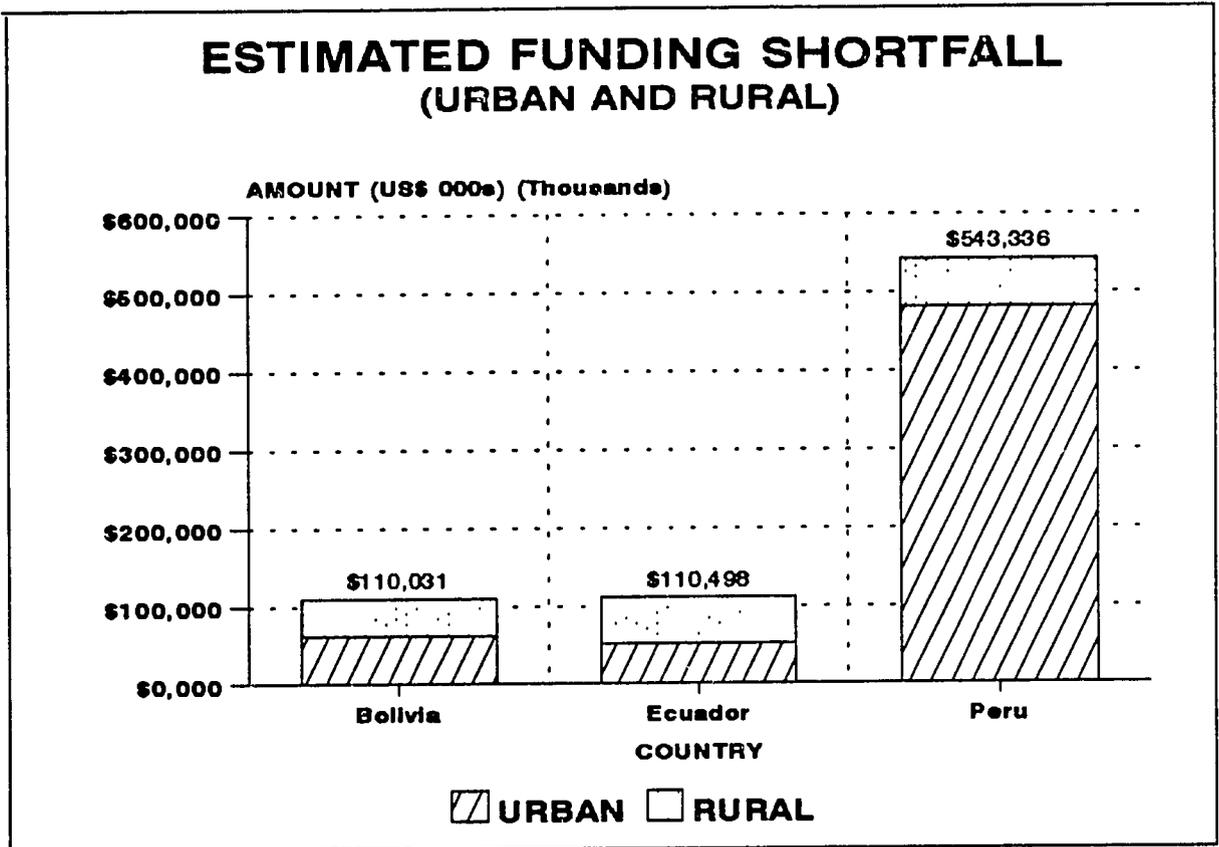


Figure 9

Table 1**Water Supply Coverage: 1980 and 1990 Coverage Levels**

WATER SUPPLY										
COUNTRY	YEAR	ALL AREAS			URBAN AREAS			RURAL AREAS		
		TOTAL POPUL.	POPUL. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POPUL. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POPUL. SERVED	% OF POP. SERVED
BOLIVIA	1980	5,600	2,044	37%	2,489	1,728	69%	3,111	316	10%
	1989	6,582	3,598	55%	3,445	2,720	79%	3,137	878	28%
	1990	6,930	3,780	55%	3,470	2,845	82%	3,460	934	27%
ECUADOR	1980	8,123	3,881	48%	3,825	3,021	79%	4,298	860	20%
	1989	10,485	6,500	62%	5,724	4,600	80%	4,761	1,900	40%
	1990	10,782	7,118	66%	5,977	4,951	83%	4,805	2,167	45%
PERU	1980	16,815	8,129	48%	10,205	6,919	68%	6,610	1,210	18%
	1989	21,823	13,050	60%	14,376	11,250	78%	7,447	1,800	24%
	1990	21,550	13,250	61%	15,053	11,306	75%	6,497	1,944	30%
TOTAL	1980	30,538	14,054	46%	16,519	11,668	71%	14,019	2,386	17%
	1989	38,890	23,148	60%	23,545	18,570	79%	15,345	4,578	30%
	1990	39,262	24,148	62%	24,500	19,102	78%	14,762	5,045	34%

Population figures are rounded to the nearest thousand

Table 2**Sanitation Coverage: 1980 and 1990 Coverage Levels**

SANITATION										
COUNTRY	YEAR	ALL AREAS			URBAN AREAS			RURAL AREAS		
		TOTAL POPUL.	POPUL. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POPUL. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POPUL. SERVED	% OF POP. SERVED
BOLIVIA	1980	5,600	1,032	18%	2,489	916	37%	3,111	116	4%
	1989	6,582	1,961	30%	3,445	1,481	43%	3,137	480	15%
	1990	6,930	2,354	34%	3,470	1,794	52%	3,460	560	16%
ECUADOR	1980	8,123	3,531	43%	3,825	2,800	73%	4,298	731	17%
	1989	10,485	6,260	60%	5,724	4,500	79%	4,761	1,760	37%
	1990	10,782	6,901	64%	5,977	4,898	82%	4,805	2,003	42%
PERU	1980	16,815	5,868	35%	10,205	5,844	57%	6,610	24	0%
	1989	21,823	9,800	45%	14,376	8,450	59%	7,447	1,350	18%
	1990	21,550	10,900	51%	15,053	9,398	62%	6,497	1,502	23%
TOTAL	1980	30,538	10,431	34%	16,519	9,560	58%	14,019	871	6%
	1989	38,890	18,021	46%	23,545	14,431	61%	15,345	3,590	23%
	1990	39,262	20,155	51%	24,500	16,090	66%	14,762	4,065	28%

Population figures are rounded to the nearest thousand.

Table 3**Water Supply Coverage: 1990 Coverage Levels vs. 1995 Targets**

WATER SUPPLY										
COUNTRY	YEAR	ALL AREAS			URBAN AREAS			RURAL AREAS		
		TOTAL POPUL.	POPUL. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POPUL. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POPUL. SERVED	% OF POP. SERVED
BOLIVIA	1990	6,930	3,780	55%	3,470	2,845	82%	3,460	934	27%
	1995	7,784	5,047	65%	3,965	3,362	85%	3,829	1,685	44%
ECUADOR	1990	10,782	7,118	66%	5,977	4,951	83%	4,805	2,167	45%
	1995	12,312	8,718	71%	7,237	6,079	84%	5,075	2,639	52%
PERU	1990	21,550	13,250	61%	15,053	11,306	75%	6,497	1,944	30%
	1995	24,501	17,591	72%	17,706	14,873	84%	6,795	2,718	40%
TOTAL	1990	39,262	24,148	62%	24,500	19,102	78%	14,762	5,045	34%
	1995	44,597	31,356	70%	28,898	24,314	84%	15,699	7,042	45%

Population figures are rounded to the nearest thousand.

Table 4**Sanitation Coverage: 1990 Coverage Levels vs. 1995 Targets**

SANITATION										
COUNTRY	YEAR	ALL AREAS			URBAN AREAS			RURAL AREAS		
		TOTAL POPUL.	POPUL. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POPUL. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POPUL. SERVED	% OF POP. SERVED
BOLIVIA	1990	6,930	2,364	34%	3,470	1,794	52%	3,460	560	16%
	1995	7,784	3,439	44%	3,965	2,175	55%	3,829	1,264	33%
ECUADOR	1990	10,782	6,901	64%	5,977	4,898	82%	4,805	2,003	42%
	1995	12,312	8,739	71%	7,237	6,151	85%	5,075	2,588	51%
PERU	1990	21,550	10,900	51%	15,053	9,398	62%	6,497	1,502	23%
	1995	24,501	14,663	60%	17,706	12,217	69%	6,795	2,446	36%
TOTAL	1990	39,262	20,155	51%	24,500	16,090	66%	14,762	4,065	28%
	1995	44,597	26,841	60%	28,898	20,543	71%	15,699	6,298	40%

Population figures are rounded to the nearest thousand.

Table 5

**Increase Over 1990 Coverage Levels Required to Meet 1995 Targets
(Number of Persons to be Served—000s)**

COUNTRY	WATER SUPPLY			SANITATION		
	TOTAL	URBAN	RURAL	TOTAL	URBAN	RURAL
BOLIVIA	1,268	517	751	1,085	381	704
ECUADOR	1,600	1,128	472	1,838	1,253	585
PERU	4,341	3,567	774	3,763	2,819	944
TOTAL	7,209	5,212	1,997	6,686	4,453	2,233

Population figures are rounded to the nearest thousand

Table 6

**Estimated Funding Needed to Meet 1995 Targets
(1990 US \$000s)**

COUNTRY	WATER SUPPLY			SANITATION			TOTAL
	SUBTOTAL	URBAN	RURAL	SUBTOTAL	URBAN	RURAL	
BOLIVIA--MEET 1995 GOALS	\$85,484	43,428	42,056	55,940	32,004	22,936	141,424
COMMITTED FUNDING	\$17,800	7,093	10,707	13,594	7,093	6,501	31,394
REQUIRED INVESTMENT	\$67,684	36,336	31,349	42,347	24,912	17,435	110,031
ECUADOR--MEET 1995 GOALS	\$104,184	74,448	29,736	128,577	86,457	42,120	232,761
COMMITTED FUNDING	\$59,801	53,351	6,450	62,462	55,749	6,713	122,263
REQUIRED INVESTMENT	\$44,383	21,097	23,286	66,175	30,708	35,407	110,498
PERU--MEET 1995 GOALS	\$297,408	271,092	26,316	254,810	219,882	34,928	552,218
COMMITTED FUNDING	\$4,457	4,227	230	4,425	4,338	87	8,882
REQUIRED INVESTMENT	\$292,951	266,865	26,086	250,385	215,544	34,841	543,336
TOTAL TO MEET 1995 GOALS	\$487,076	388,968	98,108	439,327	338,343	100,984	926,403
*COMMITTED FUNDING	\$82,058	64,671	17,387	80,481	67,180	13,301	162,539
REQUIRED INVESTMENT	\$405,018	324,298	80,721	358,847	271,164	87,683	763,865

* Committed funding for each country and for the region excludes "excess" funding beyond the amount required to meet WASH goals

Chapter 3

CONCLUSIONS

3.1 Introduction

Each of the three Andean countries faces substantial obstacles in meeting WASH's 1995 water and sanitation coverage targets. The present population lacking adequate water and sanitation infrastructure ranges from 3 million for water and 5 million for sanitation in Bolivia, to well over 8 million in both sectors in Peru. In addition, the levels of funding committed to expanding coverage differ substantially among the countries.¹ This chapter summarizes the challenges faced by each and discusses the additional investments needed to meet the WASH targets.

3.2 Meeting the 1995 Country Targets

3.2.1 Bolivia

Coverage levels in Bolivia are the lowest in the region. In 1990, only 55 percent of Bolivians had adequate access to water supplies and 34 percent to sanitation. In the rural areas only 27 percent had access to water and 16 percent to sanitation. Urban coverage was significantly higher, with 82 percent coverage in water and 52 percent in sanitation.

WASH's urban sector targets call for expanding water supply service to reach 65 percent of the population and sanitation coverage for 55 percent. The rural targets require 17-point increases over current levels: water coverage is targeted at 44 percent and rural sanitation at 33 percent to bring overall coverage to 65 percent in water and 44 percent in sanitation.

Although these percentage increases are comparable to those for Ecuador and Peru, Bolivia's relatively small population of 6.9 million (less than one-third the population of Peru) makes the number of people represented by these percentages smaller than the targets for the two neighboring countries. To reach the targeted coverage levels, Bolivia must provide adequate water access to an additional 517,000 urban residents and 751,000 rural dwellers, a total of 1,268,000 persons, and sanitation facilities to 381,000 urban and 704,000 rural inhabitants, a total of 1,085,000 individuals.

¹ It should again be noted that this analysis includes only external donations and national counterpart funding for externally financed projects. Other national investments are not considered.

Approximately \$31.4 million has been committed to extend service delivery over the next five years, with few prospects for additional funding under discussion. Based on this commitment, WASH estimates that Bolivia will need an additional \$110 million to meet the targets, a figure which though substantial still understates Bolivia's water and sanitation needs.

The role of water and sanitation in the transmission of disease is exemplified by the disparity in infant and child mortality rates among the three countries: Bolivia's child mortality rate is 20 points higher than that for Peru and 42 points higher than that reported for Ecuador. WASH's target levels would be inadequate to significantly affect the widespread transmission of infectious and parasitic diseases. To fully reap the health benefits associated with broad access to water and sanitation infrastructure, Bolivia must quickly surpass these levels.

3.2.2 Ecuador

Overall, 66 percent of Ecuador's population has adequate access to water and 64 percent to sanitation services. Coverage estimates for each of the four subsectors are higher in Ecuador than in either Bolivia or Peru. In 1990, coverage has been estimated at 83 percent for urban water, 45 percent for rural water, 82 percent for urban sanitation, and 42 percent for rural sanitation.

Because Ecuador enjoys relatively high coverage in percentage terms, the increases necessary to meet the targets are small in comparison with those for the other two countries. This is particularly true in the urban subsectors: gains of 1 percent in urban water supply service and 3 percent in sanitation are sufficient to meet the 1995 goals of 84 percent and 85 percent, respectively. With heavy urbanization and high population growth rates, however, these goals correspond to providing an additional 1,128,000 persons with water and 1,253,000 with sanitation. Percentage targets for rural areas are slightly higher, calling for 7 percent growth in water coverage (to 52 percent) and 9 percent in sanitation services (to 51 percent). Under current growth trends, these goals necessitate providing water service to 472,000 and sanitation service to 585,000 individuals.

Ecuador has the largest pool of committed external assistance for expanding water and sanitation services, as well as the highest 1990 coverage rates. Despite these advantages, it faces a substantial shortfall in funding. A total of \$233 million is necessary to achieve the 1995 targets, of which \$122 million has been committed, leaving a shortfall of \$110 million.

3.2.3 Peru

Peru, the most populous of the three countries, must undertake by far the largest infrastructure expansion programs to meet the WASH targets. Coverage estimates for 1990 indicate that less than two-thirds (61 percent) of Peru's 21.6 million residents have adequate access to water supplies and only one-half (51 percent) have adequate access to sanitation facilities, a

deficiency that contributes significantly to the high morbidity and mortality rates from infectious and parasitic diseases, most notably the recent outbreak of cholera.

The WASH targets call for substantial increases in coverage, which, given the political and financial instability that continue to plague Peru, will be difficult to attain. Overall, the targets call for providing water service to 4 million and sanitation service to 3.8 million. This will mean expanding urban water service coverage from 75 to 84 percent, for an additional 3.6 million, and sanitation coverage from 62 to 69 percent, for an additional 2.8 million. Targets for rural areas require water service for 40 percent of the population (from 30 percent in 1990) and sanitation service for 36 percent (from 23 percent), corresponding to increases of 774,000 and 944,000, respectively, in coverage.

WASH's calculations show that \$552 million, or more than half the total regional investment, is needed to bring water and sanitation services to the prescribed levels. Thus far less than \$9 million has been committed by external donors leaving a deficit of \$543 million. Given the economic challenges currently facing the government, supplemental foreign assistance is vital to Peru's efforts to develop the sector.

Because of the skewed distribution of the population (nearly 70 percent of Peruvians live in urban areas), 89 percent of the supplemental financial assistance needed is required to support urban sector development. This skewed distribution is reflected in current funding commitments, of which 96 percent is allocated to urban locales. Urban infrastructure development is critical to combating serious industrial and residential waste pollution and the constant strain on existing resources from continued urbanization. The sprawling barrios that surround Peru's major cities lack access to clean water and sanitary excreta disposal and are breeding grounds for the spread of disease.

Despite the obvious need for attention to urban areas, the targets established for rural zones remain disturbingly low. It is critical that rural areas, which also suffer from severe health and environmental problems, are not neglected in future sectoral development efforts.

3.3 Regional Summary

Each of the Andean countries in this study faces substantial challenges in attaining the 1995 coverage targets. The chief obstacle is the lack of available funding. Of the estimated \$926 million necessary to bring regional coverage to the target levels, only \$163 million has been committed, leaving a deficit of \$764 million. To eliminate this deficit, approximately \$153 million in additional investments must be committed each year over the next five years.

Regionwide, current external commitments are concentrated in urban zones, with only 19 percent directed to rural areas. Despite this, deficits in urban areas are significantly greater than those in rural regions, making up 80 percent of the total shortfall. In order to expand coverage

in each subsector to the prescribed 1995 levels, an additional investment of \$324 million will be necessary for urban water, \$271 million for urban sanitation, \$81 million for rural water, and \$88 million for rural sanitation. The larger urban investment needs are the result of two factors: regionwide urbanization, and the greater costs of installing more sophisticated urban water supply and sanitation facilities.

Urban development generally is given priority for a range of reasons, including greater pollution from industrial sources and dense residential populations, political importance, and tourism. However, the health implications of unsanitary conditions are equally, or even more, severe in rural regions, which frequently lack even basic health care services. Current coverage levels are substantially lower in rural zones than in urban centers in each of the three countries. Consequently, the 1995 targets would bring rural areas to levels of coverage still significantly below those for urban zones. If rural populations are to achieve coverage parity with urban inhabitants, investments in rural advances must be given greater importance.

Another consideration is that development efforts generally focus on extending basic services because of the low levels of coverage and widespread poverty. But they cannot afford to neglect the upgrading and rehabilitation of existing services when the environment and public health are major concerns.

International donor agencies, notably A.I.D., the IDB, KfW, and the World Bank, have played a significant role in expanding water and sanitation services in these countries. Financing for activities in municipal areas comes primarily from loans from the IDB and the World Bank; rural development has been supported mainly by A.I.D. and KfW. Large portions of the funding for urban sector development support rehabilitation and upgrading rather than service expansion. In rural areas, external funding focuses on expanding available services.

In most cases, the financing of water and sanitation projects involves both local and external financing. With growing inflation, indebtedness, and other financial difficulties, there is little funding available for local investments in the sector. A.I.D.'s projects normally are financed with Development Assistance (DA) funds, or in urban areas, through the Housing Guarantee (HG) program, and often involve local counterpart funding. Because of the dearth of local funds, however, A.I.D. has in some cases financed the local component through the Economic Support Fund (ESF). It may also be able to assist countries with local capital formation for investments in future projects in the sector.

3.4 WASH's Lessons Learned

This report has focused on the importance of constructing facilities to increase access to water supplies and sanitary systems for excreta disposal. However, in the past 10 years, the WASH project has learned that merely providing access to water and sanitation is not enough.

In rural communities, where diarrheal and intestinal diseases contribute significantly to infant and child mortality and morbidity, health and hygiene education is a particularly critical element of water and sanitation activities. Environmental education and improvements are also critical in urban areas, where other sources of pollution are becoming increasingly problematic. Appropriate solutions for solid waste and industrial waste disposal are essential to ensure that water supplies are potable.

It is not sufficient to provide funding to local institutions, which may lack the capacity to absorb such resources. Training in maintenance and operations is critical to ensuring the sustainability of water supply and sanitation improvements. Information systems, improved planning, and the reduction of unaccounted for water in urban systems are other areas that need attention. Countries in the region have relied heavily on loans from the IDB and the World Bank to finance projects in the sector. Given their difficulties in repaying currently outstanding loans, these countries should seek alternative methods of financing to supplement these loans, including donations and cost-recovery or tariff schemes. The development and transfer of inexpensive appropriate technologies are also vital so that systems that can be efficiently installed and maintained are adapted to suit local conditions.

National and community-level participation in planning, execution, and maintenance is important to the success of water and sanitation programs. In addition, the private sector could be invited to play a more prominent role in areas such as system maintenance and operation, financing, project design, construction, and the provision of materials and supplies.

The water and sanitation goals established either by external agencies or by national or regional entities require substantial investments, which will yield lasting results when the various agencies, institutions, and communities involved are willing to work together at both the policy and operational levels, and to make long-term commitments to build the systems and the capacity to maintain them.

INTRODUCTION TO THE APPENDICES

The status of water and sanitation coverage in each of the three Andean countries is examined in detail in the following appendices. Each country profile describes current and proposed externally funded projects, current coverage levels, the 1995 targets for each subsector, and the investment required to attain the goals. The appendices also provide health, economic, and social indicators and a brief overview of socioeconomic and health conditions.

DATA SOURCES

General background information on each country was drawn primarily from PAHO's 1990 Health Conditions in the Americas. Other data were obtained from the following sources:

Population

Population data, including urban/rural breakdowns and current growth rates, were provided by the USAID missions and obtained from national statistics, census, or planning offices.

Population estimates for 1995 were obtained by extrapolating current populations, using the growth rates provided.

Infant and Under 5 Mortality Rates

These figures were provided by A.I.D.'s Center for International Health Information; they represent the best available figures for selected indicators as maintained by CIHI.

Infant Mortality Rate: The estimated number of deaths in infants (children under age one) in a given year per 1,000 live births in that same year. An IMR may be calculated by direct methods (counting births and deaths) or by indirect methods (applying well-established demographic models).

Under 5 Mortality: The estimated number of children born in a given year who will die before reaching age 5 per thousand live births in that same year. The under 5 mortality may also be calculated by direct or indirect methods.

Mortality Rate due to Infectious/Parasitic Diseases and Diarrheal/Intestinal Diseases

This information from PAHO's 1990 Health Conditions in the Americas represents the number of deaths from these diseases per 100,000 persons.

Life Expectancy and Adult Literacy, GNP per Capita, GNP Growth Rate, and Inflation

These data were taken primarily from two World Bank publications: the 1990 World Development Report and Social Indicators of Development, 1990.

Currency Exchange Rates

Foreign exchange rates were obtained from the Wall Street Journal of April 15, 1990.

Estimated per Capita Unit Costs for Construction of Facilities

Unit costs for the construction of water supply and sanitation facilities were derived from data provided by PAHO. Current unit costs reflect a 5 percent increase over the estimates used in the 1989 study.

TABLES AND FIGURES

Each profile includes a number of tables and figures that document the coverage and investment data discussed in the main text. They appear at the end of each appendix in the following order:

Actual Water Supply Coverage vs. 1995 Targets

Table 1 provides historical data on water supply coverage in urban and rural areas for selected years from 1980 to 1990 and the targets for 1995. Coverage is expressed in terms of the number of individuals and the percentage of the population with access to water services.

Actual Sanitation Coverage vs. 1995 Targets

Table 2 provides historical data on sanitation coverage and the goals for 1995. As in Table 1, coverage is expressed in terms of percentages and numbers of persons.

Urban and Rural Water Supply Coverage

Figure 1 tracks water supply coverage in urban and rural areas by percentage from 1985 to 1990.

Urban and Rural Sanitation Coverage

Figure 2 charts data for sanitation in the same format as Figure 1.

Investment Needed to Meet 1995 Targets

Table 3 presents an estimate of the investment needed to attain the objectives for 1995, as well as the projected investment shortfall. This table also provides the data from which the investment requirement is calculated. The number of persons to be covered by 1995 was multiplied by the per capita costs of constructing water and sanitation facilities to determine the total investment needed. Firmly committed investments to expand coverage were then deducted from this figure to estimate the funding shortfall. Figure 3 provides a visual reference. The shaded portion represents current commitments and the patterned portion shows the shortfall.

1990 Coverage vs. 1995 Targets (Percentage of Population with Coverage)

Figure 4 compares 1995 targets, expressed as percentage goals, with the current (1990) percentage of each country's population that has water and sanitation coverage.

1990 Coverage vs. 1995 Targets (Number of Persons with Coverage)

Figure 5 compares the number of persons who currently have access to water and sanitation services with the number required to meet the 1995 targets.

APPENDIX A

BOLIVIA

COUNTRY BACKGROUND

The 1980s marked the beginning of an economic crisis for Bolivia, described as the worst in the country's history. Bolivia, which covers 1,098,581 square kilometers in the Andean highlands, is heavily dependent on the export of raw materials and its economy suffered during the global recession of the past decade. From 1985 to 1987, the agricultural, mining, and petroleum industries declined, while the manufacturing, service, and commercial sectors grew (PAHO). The country showed some signs of economic recovery in 1987, when the decline in the GDP was lower than in previous years. According to a 1989 World Bank report, inflation, which averaged more than 600 percent between 1980 and 1987, fell to 15.7 percent in 1987.

COUNTRY PROFILE

1990 Population:	6.93 million
	Urban: 3.47 million
	Rural: 3.46 million
Population Growth Rates:	2.2%
	Rural: N/A
	Urban: N/A
Infant Mortality Rate:	98
Under 5 Mortality Rate:	151
Mortality Rate due to Infectious and Parasitic Diseases:	N/A
Mortality Rate due to Diarrheal Diseases:	110
Life Expectancy	Female: 56
	Overall: 53.7
Adult Literacy Rate:	74%
GNP per Capita (1988):	\$570
GNP per Capita (1989):	\$620
GNP per Capita Annual Growth from 1965-88:	-.6%
Currency:	Boliviano 3.51 = \$1
Average Annual Inflation from 1980-88:	482.8%

The economic crisis made the generally poor living conditions for Bolivians even worse. Unemployment reached 21.5 percent in 1987. Approximately 44 percent of Bolivia's 6.9 million inhabitants are under the age of 15. With the current birth and death rates, it is estimated that there are approximately 89 dependents (under 15 or over 65) for every 100 persons between the ages of 15 and 64. PAHO reports that the 1976 census indicated that 76 percent of dwellings had no more than one bedroom. Today, the nationwide housing deficit is estimated at 650,000 units—65 percent of the total housing requirement. PAHO also states that 90 percent of rural dwellings do not meet minimum acceptable living conditions, largely as a result of serious sanitation deficiencies and overcrowding.

The primary health problems faced by Bolivians are infectious, parasitic, and nutritional diseases. Infectious intestinal diseases (diarrhea) and pneumonia account for 21 percent of all deaths (PAHO) and are also important causes of morbidity: in 1985, 63 percent of communicable diseases reported were acute respiratory and diarrheal diseases. Acute diarrheal diseases are the leading cause of morbidity and mortality in children under 1 year. Inadequate

water and basic sanitation facilities contribute to the spread of diarrhea and other infectious diseases.

Slightly more than half of the Bolivian population has access to adequate water supplies and one-third to sanitation services. Water and sanitation systems currently in service are in dire need of rehabilitation and upgrading; for example, only three cities have wastewater treatment facilities. As a consequence of such deficiencies, several major river basins are severely polluted.

A large network of agencies is involved in developing and maintaining water and sanitation resources. The Ministry of Planning and Coordination (MPC) is primarily responsible for overall planning and coordination of external and government financing in the sector. The Comité Técnico de Asesoramiento (COTEAS), currently being restructured, and the Dirección Nacional de Infraestructura Urbana, a division of the Ministry of Urban Affairs, also have important roles.

The Asociación Nacional de Empresa de Servicio de Agua Potable y Alcantarillado (ANESAPA) is the agency primarily responsible for coordinating and implementing water supply and sanitation development. The Corporación de Agua y Alcantarillado (CORPAGUAS), a division of the Ministry of Urban Affairs, coordinates the activities of semi-autonomous companies or cooperatives (Cooperativas y Juntas de Administración—CJAs) responsible for managing urban water supply and sanitation. Tariffs on services, applied in urban areas, are approved and administered by the Consejo Nacional de Tarifas (CONATA).

Regional Development Corporations (Corporaciones Departamentales de Desarrollo) also operate in each of Bolivia's nine departments, using funds generated from petroleum exports and other fiscal revenues to support regional development, including water and sanitation. In rural areas, the Ministry of Health's Dirección Saneamiento Ambiental (DSA) coordinates all water and sanitation activities, which are implemented by Empresas de Servicios Locales (ESLs).

COVERAGE LEVELS AND INVESTMENT

Current Projects

- **A.I.D.**

A.I.D.'s six-year Community and Child Health Project contains a \$4.5 million water and sanitation sub-component. The project, which began in 1989, will finance the construction of 120 rural water systems with 7,000 latrines in three departments: La Paz, Cochabamba, and Santa Cruz. Approximately 60,000 rural Bolivians will be served by these facilities. This project also assists national immunization, diarrhea, and Chagas' disease programs in Bolivia.

CARE/Canada, \$5 million to UNICEF, and \$3.1 million to Club 2/3. WASH estimates that less than 50 percent of the funds remaining will extend water and sanitation services to new users; the balance will support health care, irrigation, educational programs, and rehabilitation and upgrading.

Total funding committed to expand coverage: \$4,000,000

- **Government of Germany**

Through GTZ, the German government supports two projects: a study to improve the Incachaca water reservoir and the capacity of the water system; and development of the institutional capacity of ANESAPA. Financing for the first totals \$3.1 million and for the second \$250,000.

GTZ is also assisting in the development of ANDESAPA, the Andean regional water association. Phase II of this effort, to be implemented between 1989 and 1991, covers four areas: institutional strengthening at the regional and national levels; training of personnel at all levels and the development of training materials; the application and dissemination of appropriate technologies; and the development of programs for the control of technical and financial water losses. A total of \$2.3 million has been allocated to support CAPRE (the Central American regional water and sanitation organization) and ANDESAPA.

One recently completed GTZ project involved improvement of the operation and maintenance of water supply systems and treatment plants, including a treatment plant in El Alto. It also provided for the installation of meters, the improvement of sanitation systems, sanitation education, the development of a cost recovery system, and training programs. The three-year project was funded at \$2,050,200. Another completed project was a \$1,884,600 program for improving operation and maintenance, planning and implementing pilot flood protection measures, and developing basic sanitation to reduce soil contamination.

In addition to technical assistance, Germany provides financial support to Bolivia's water and sanitation sector through KfW. Funding has been provided for water channel rehabilitation, including the extension of the treatment plant in Sucre (\$ 9.3 million). In the city of Oruro, KfW financing (\$4.8 million) supports the rehabilitation and extension of water supply services. KfW is also providing \$2.9 million for the construction of water supply systems and latrines in the rural areas of the Oruro department.

Plans for two additional projects are currently underway. KfW recently approved a \$445,000 loan for a study on the rehabilitation of the sewerage and water supply systems in the city of Sucre. A sewerage project in the city of El Alto is likely to receive \$13 million. No current GTZ projects directly support the expansion of rural water and sanitation services. WASH has

included an estimate of outstanding disbursements under KfW projects in the investment analysis.

Total funding committed to expand coverage: \$2,700,000

- **IDB**

Two major IDB-sponsored water and sanitation projects benefiting the cities of Tarija, Cochabamba, and La Paz were completed last year. A \$30 million loan for rehabilitation in Cochabamba and La Paz was approved in 1990 and implementation of this project by CORPAGUAS will begin shortly. Ten percent of the funding has been allocated to the investment analysis.

Plans for a second water supply and sanitation project are still underway. This project, to benefit 11 cities, is projected to cost \$100 million, of which the IDB is contributing \$70 million in loan financing. Studies and designs were undertaken jointly by PAHO and the IDB. The IDB anticipates that project activities will begin in 1993.

Total funding committed to expand coverage: \$3,000,000

- **PAHO**

Through December of 1991, PAHO is providing assistance for the institutional strengthening of the Ministry of Health's Division de Saneamiento Ambiental (DSA), including technical support in water quality control, sanitation education and operation and maintenance in the rural areas, and the development of information systems. PAHO is also providing technical support to ANESAPA, including assistance in adapting and developing appropriate technologies, developing strategies for solid waste disposal, incorporating regional plans, and strengthening mechanisms for coordination.

With funding from the IDB, PAHO recently completed a six-year wastewater collection project in Tarija and assisted in the preparation of water and sanitation development master plans for 10 cities.

Total funding committed to expand coverage: \$0

- **United Nations**

The U.N. Capital Development Fund plans to sponsor a water and sanitation project in the peri-urban barrios of the city of Oruro beginning in late 1991. The four-year effort will involve

rehabilitating and installing secondary sewerage lines in the impoverished settlements surrounding the city. In addition, it will provide credit and technical assistance to households to install direct connections to sewerage lines, as well as to install and improve latrines. It will also support water improvements, financing the construction of a number of wells and house connections to public water mains, which, however, will be contingent upon the householders' procuring a loan for the installation of a sewerage connection. Project funds will also finance the construction of a rudimentary treatment plant that will combine the treatment of wastewater effluents and sewage waste. Financing for the project will come primarily from the UNCDF, which will provide \$5 million, with \$230,000 in support from the UNDP and \$340,000 from the GOB.

Startup of the UNDP's \$2.8 million Basic Sanitation in Potosí project is also anticipated during 1991. This two- to three-year effort will support home-based sanitation development in Potosí, one of the poorest districts in Bolivia. This project, which is being jointly implemented with the World Bank, will focus on installing improved water supplies in villages throughout the region. Financing for the project has been committed by the Government of the Netherlands.

WASH estimates that 50 percent of the Oruro project financing and 80 percent of the Potosí funds will be committed to expanding services to populations without access to water and sanitation.

Total funding committed to expand coverage: \$5,025,000

- **UNICEF**

In its current five-year project cycle, scheduled to run to 1994, UNICEF has integrated its water and sanitation activities and its rural development program covering selected districts in two departments—northern Potosí and southern Cochabamba. Approximately \$1.6 million will be expended on water and sanitation activities under UNICEF's \$5.9 million PROANDES project, financing for which has been provided by Italy, Spain, and Sweden.

Water and sanitation activities will be implemented in approximately 365 villages in the region. Priorities for each village are determined in discussions prior to implementation; water and, to a lesser extent, sanitation facilities generally rank high on the list of needs. UNICEF is installing gravity-fed water systems and latrines, focusing primarily on households rather than on communal facilities. Other components of the PROANDES project include training of health promoters, immunization of children, basic health and hygiene education, nutrition education, and food production. Nineteen NGOs are participating in the project. Allowing for

spending on training and rehabilitation, 80 percent of the estimated remaining project funds are included in the analysis.

Total funding committed to expand coverage: \$768,000

- **ODA**

The United Kingdom's Overseas Development Agency is currently financing a two-year, \$2 million water and sanitation program in the Yungas. The project's planned scope includes well construction, sanitation, irrigation, and health education. Because it is unclear whether activities linked to service expansion will continue in 1991, no funding has been included in the analysis.

Total funding committed to expand coverage: \$0

- **World Bank**

The World Bank's ongoing Major Cities Water and Sewerage Rehabilitation Project is scheduled to run from 1990 to 1995. The \$57 million effort is being co-financed by KfW, which will provide a total of \$8 million, and is to be supported by \$25 million in local funds. World Bank funds will support activities in the cities of La Paz, Santa Cruz, and Cochabamba. With KfW sponsorship of development efforts in the city of El Alto, the project will benefit approximately one million people.

The project is to be implemented by the municipal water and sanitation agencies of each city: Servicio Autónomo de Agua Potable y Alcantarillado de La Paz (SAMAPA); Cooperative de Servicios Públicos Santa Cruz Limitada (SAGUAPAC); and Servicio Municipal de Agua Potable y Alcantarillado de Cochabamba (SEMAPA). The La Paz water utility will also administer the El Alto component of the project. The GOB will provide loan financing to each agency through the National Fund for Regional Development (FNDR).

While the project will focus on the rehabilitation and expansion of water supply, sewerage, and sewerage treatment facilities in the four cities, it will also work to improve the operational efficiency of the municipal water utility companies and the management capabilities of the central sector agencies. It will finance the construction and upgrading of water treatment plants, storage tanks, transmission lines, pumping stations, and wells and will provide technical assistance and training, engineering design services, and management systems.

Based on current implementation plans, WASH estimates that only 10 percent of project funds will support the extension of water and sanitation services to new users.

Total funding committed to expand coverage: \$5,700,000

Current Coverage

At the end of 1990, an estimated 55 percent of Bolivians had adequate access to water supplies and 34 percent to sanitation. Although coverage remains low, substantial gains have been made since 1980, when water coverage stood at 37 percent and sanitation coverage at 18 percent. These advances represent service to 1,736,000 new users in the water sector and 1,322,000 in sanitation.

During the past year, access to sanitation increased by 4 percent and access to water (percent of population served) remained unchanged. These coverage levels represent the extension of water services to an additional 182,000 persons and of sanitation services to an additional 393,000. Coverage estimates for Bolivia in 1990 and for selected years over the past decade are provided in Tables A-1 and A-2.

Bolivia's urban population has seen substantial improvement in water and sanitation coverage over the past decade. Water coverage has expanded to reach 82 percent of the urban population, from 69 percent in 1980, while sanitation services are now available to 52 percent of the urban population, from 37 percent. Coverage in rural areas has also increased, though less significantly, with water service expanding from 10 percent to 27 percent, and sanitation from only 4 percent in 1980 to the current estimate of 16 percent.

Meeting the 1995 Urban Water and Sanitation Targets

WASH estimates that 2,845,000 of Bolivia's 3,470,000 urban residents, or 82 percent, have adequate access to water supplies (Table A-1). The 1995 target raises this to 85 percent. However, only 1,794,000 urban residents, or 52 percent, have adequate access to sanitation facilities (Table A-2).

Bolivia's population is expected to grow by more than 850,000 over the next five years, with the urban population increasing by approximately 485,000. Based on these estimates, the 1995 WASH targets call for extending water supply services to more than half a million urban residents (517,000) and sanitation facilities to 381,000 (Table A-3). These increases require an investment of \$75.4 million: \$43.4 for water and \$32 for sanitation. As of 1990, only \$14.2 million in external assistance had been committed, leaving a deficit of \$61.2 million. Over the next five years, Bolivia expects to receive substantial additional funding from several donor agencies, including KfW (\$13 million) and IDB (\$70 million), but most of these monies will provide for rehabilitation and improvements rather than for service expansion.

Meeting the 1995 Rural Water and Sanitation Targets

Access to both water supplies and sanitation facilities in rural Bolivia is deplorably low. The rugged mountains create difficulties for the expansion of public services. As a result, of the estimated 3,460,000 rural residents of Bolivia, only 27 percent, or 934,000, have adequate access to water and only 16 percent, or 560,000, to sanitation facilities.

With \$17.2 million in external assistance committed to expand water and sanitation services in rural areas over the next five years, it seems unlikely that Bolivia will be able to attain the WASH targets of 44 percent for water coverage and 33 percent for sanitation coverage by 1995. Current commitments are less than one third (26 percent) of the total needed, and would suffice to bring water to only 29 percent of the projected rural population, and sanitation to only 20 percent. WASH estimates that an additional \$48.7 million (\$31.3 for water and \$17.4 for sanitation) is needed to reach the target levels. With no additional aid, Bolivia will face difficulties in obtaining funds to meet this shortfall.

Bolivia's rural population has dangerously low access to water and sanitation services. Current resource commitments will do little to raise access to safer levels and clearly increased funding must be a priority.

Table A-1**Actual Water Supply Coverage vs. Targets**

WATER SUPPLY									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	5,600	2,044	37%	2,489	1,728	69%	3,111	316	10%
1986	6,569	2,870	44%	3,132	2,286	73%	3,437	584	17%
1988	6,400	3,378	53%	3,300	2,541	77%	3,100	837	27%
1989	6,582	3,598	55%	3,445	2,720	79%	3,137	878	28%
* 1990	6,930	3,780	55%	3,470	2,345	82%	3,460	934	27%
TARGETS FOR 1995	7,784	5,047	65%	3,955	3,362	85%	3,829	1,685	44%

Population figures are rounded to the nearest thousand.

Population estimates for Bolivia have been revised; the 1990 population is currently estimated at 7.3 million rather than 6.9 million. WASH plans to revise its estimates for population and the corresponding coverage figures in future updates of this report. Nonetheless, WASH believes that the data above are still useful for estimating purposes, and reflect the current situation in Bolivia's WSS sector. It is, however, important to note the likelihood that investment requirements in future reports will be increased as a result of the new population figures.

*1990 coverage figures are WASH estimates based on the World Bank's Social Indicators of Development, 1990.

Table A-2**Actual Sanitation Coverage vs. Targets**

SANITATION									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	5,600	1,032	18%	2,489	916	37%	3,111	116	4%
1986	6,569	1,378	21%	3,132	1,034	33%	3,437	344	10%
1988	6,400	1,820	28%	3,300	1,386	42%	3,100	434	14%
1989	6,582	1,961	30%	3,445	1,481	43%	3,137	480	15%
* 1990	6,930	2,354	34%	3,470	1,794	52%	3,460	560	16%
TARGETS FOR 1995	7,784	3,439	44%	3,955	2,175	55%	3,829	1,264	33%

Population figures are rounded to the nearest thousand. See note on population figures, Table A-1.

*Distribution of urban/rural data for 1990 has been adjusted by WASH to match definitions and previous trends.

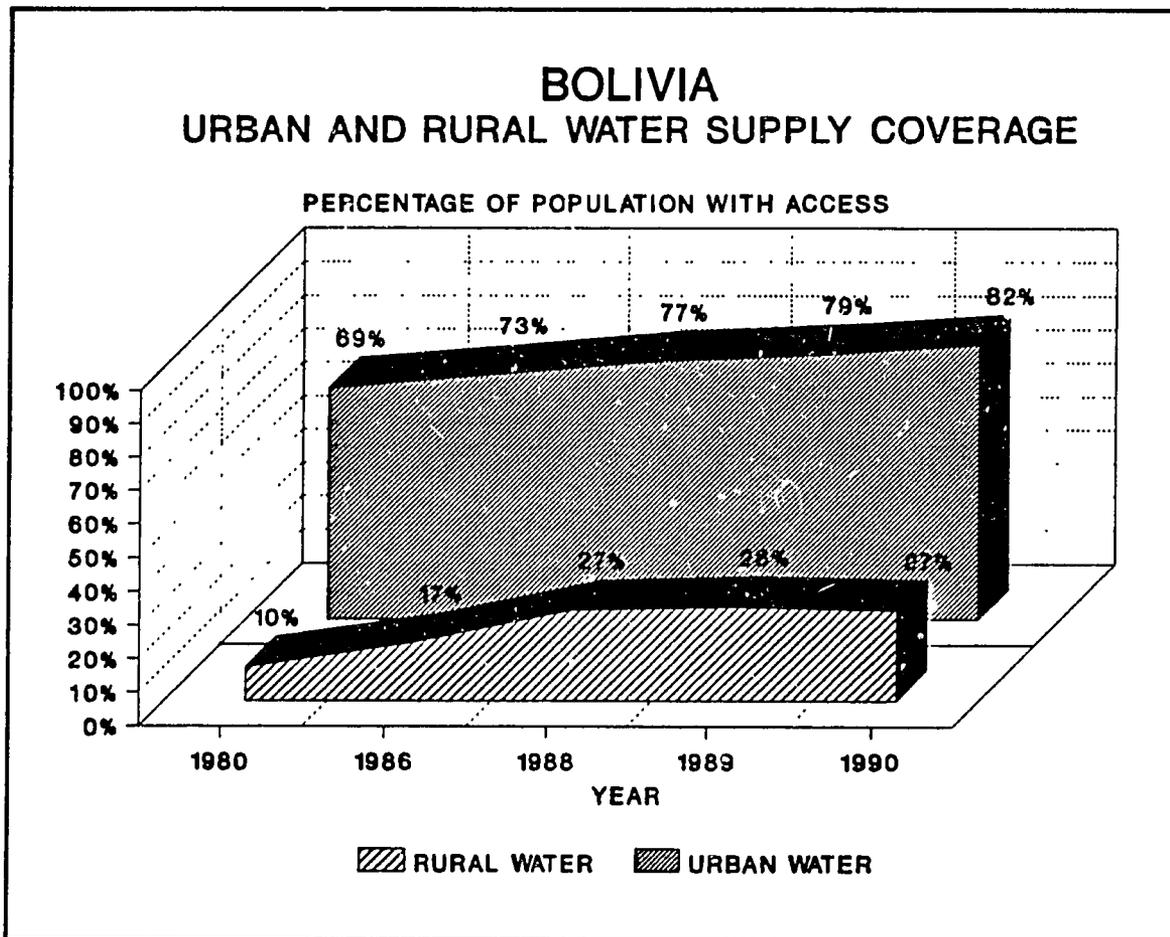


Figure A-1

BOLIVIA URBAN AND RURAL SANITATION COVERAGE

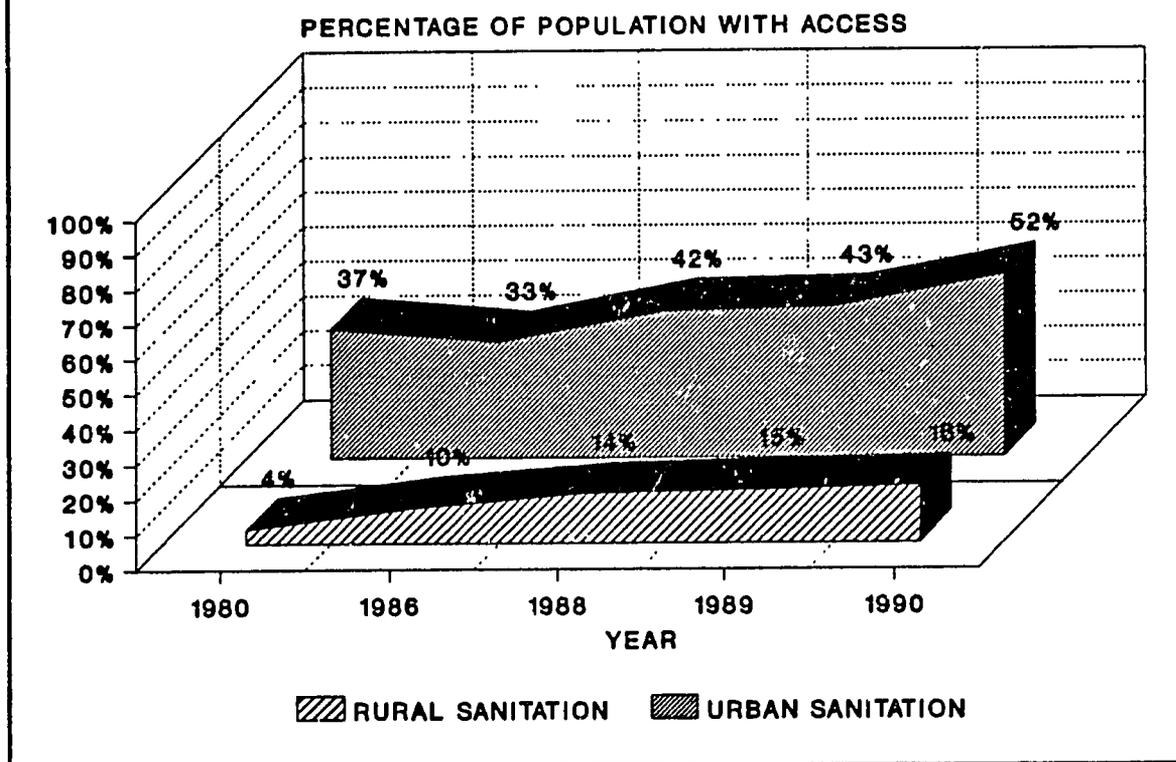


Figure A-2

Table A-3

**Investment Needed to Meet 1995 Targets
(1990 US \$000s)**

	WATER SUPPLY COVERAGE (PERSONS-000s)			SANITATION COVERAGE (PERSONS-000s)		
	TOTAL	URBAN	RURAL	TOTAL	URBAN	RURAL
TARGET FOR 1995 (000s) COVERAGE IN 1990	5,047	3,362	1,685	3,439	2,175	1,264
	3,779	2,845	934	2,354	1,794	560
REQUIRED INCREASE	1,268	517	751	1,085	381	704
ESTIMATED UNIT COSTS (US \$ PER CAPITA)	N/A	\$84	\$56	N/A	\$84	\$34
ESTIMATED TOTAL COST TO MEET 1995 TARGETS	\$85,484	43,428	42,056	55,940	32,004	23,936
FIRMLY COMMITTED INVESTMENTS (000s)*	\$17,800	\$7,093	\$10,707	\$13,593	\$7,093	\$6,501
PROJECTED FUNDING SHORTFALL (\$000s)	\$67,684	36,336	31,349	42,347	24,912	17,435

TOTAL FUNDING SHORTFALL \$110,031

* Includes only those investments to increase coverage

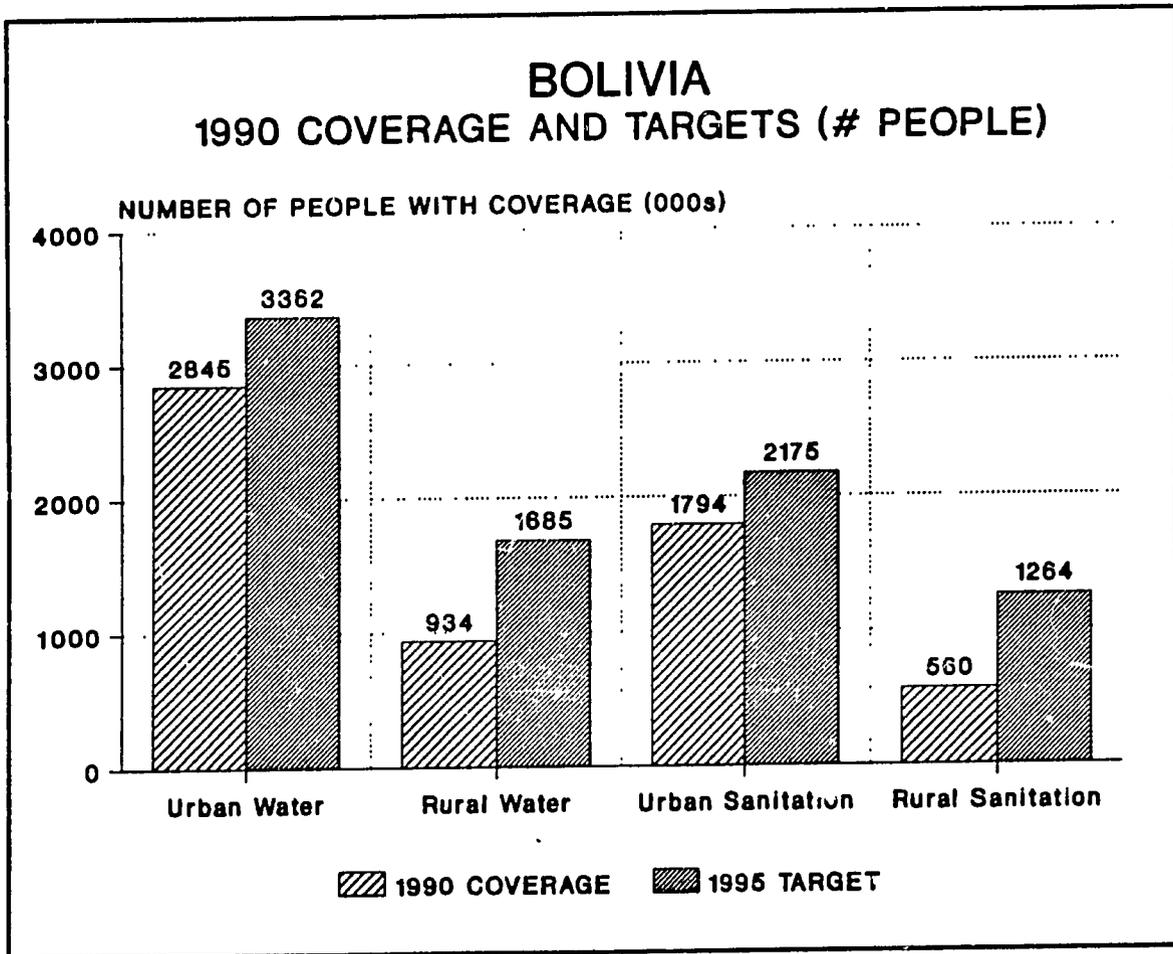


Figure A-3

BOLIVIA 1990 COVERAGE AND TARGETS (% OF POP.)

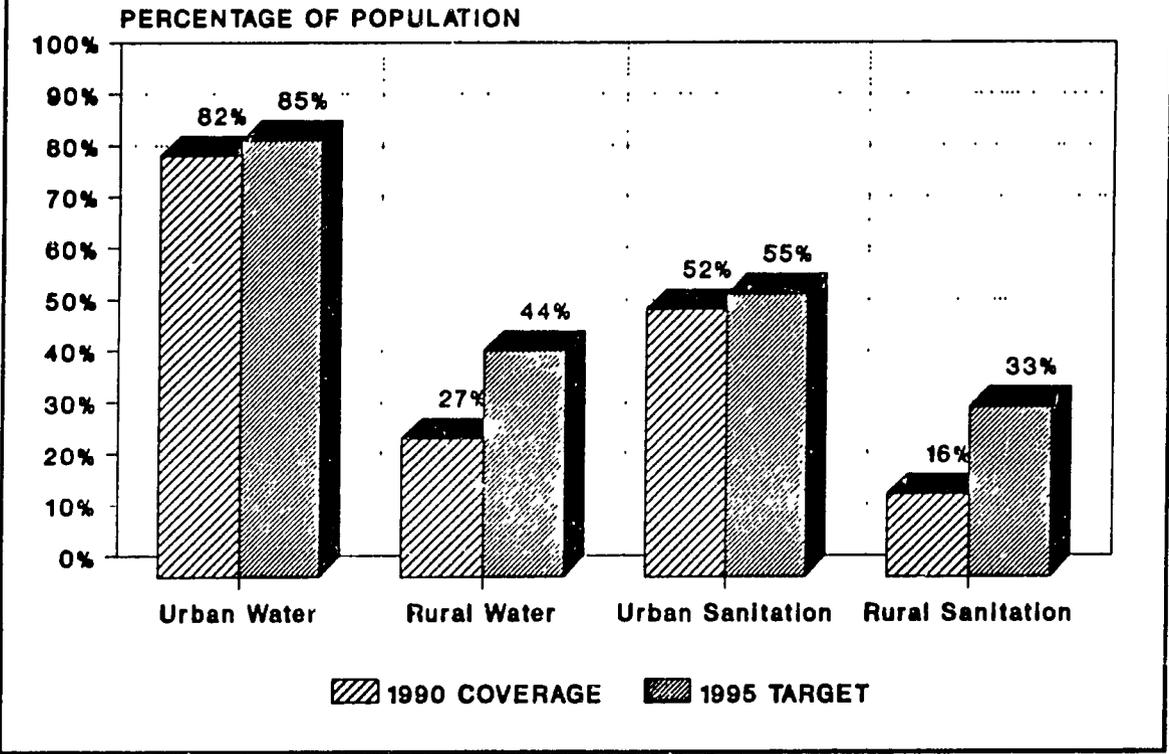


Figure A-4

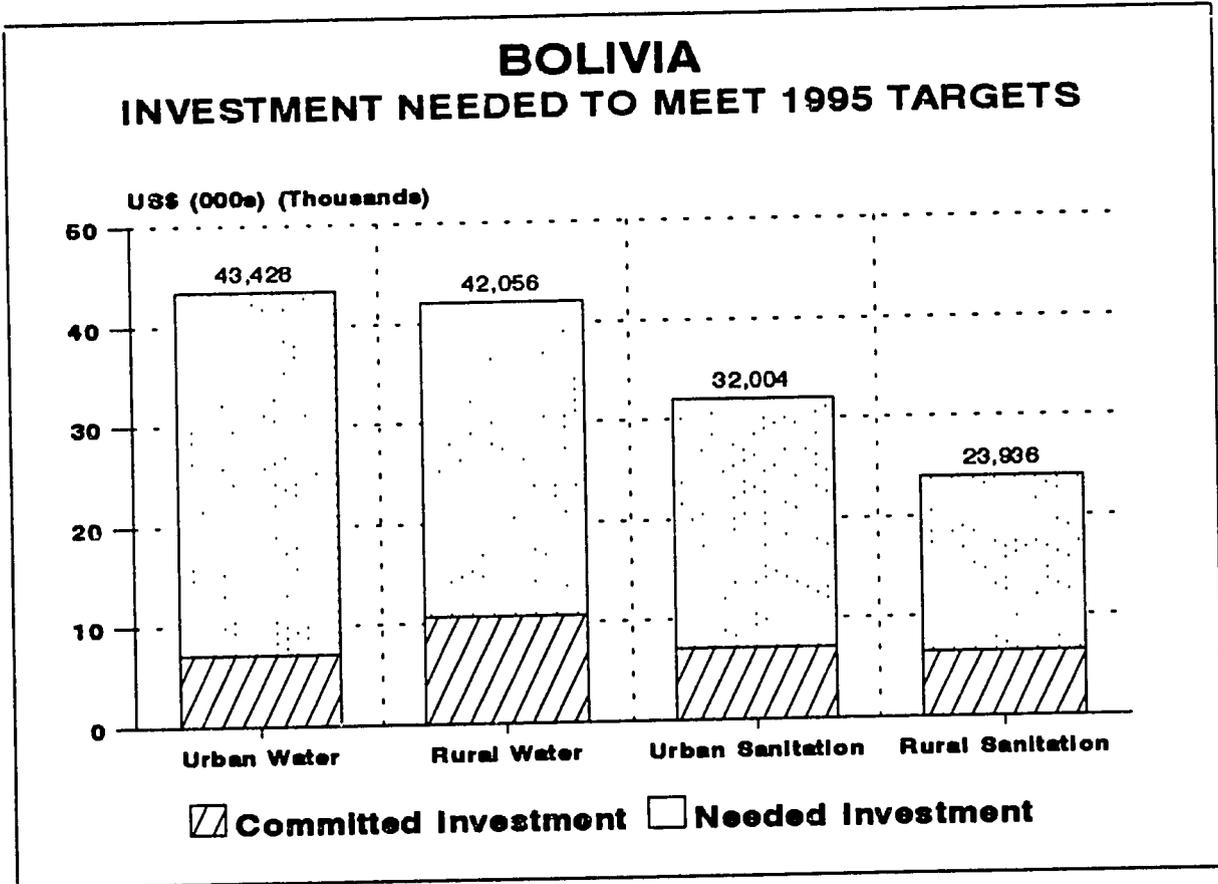


Figure A-5

APPENDIX B

ECUADOR

COUNTRY BACKGROUND

Like most of its South American neighbors, Ecuador currently faces serious economic challenges. Between 1984 and 1987, foreign trade in goods and services was unfavorable, resulting in a cumulative deficit of \$2.19 billion. During this period, per capita GDP declined by 6 percent, reflecting increasing inflation and a declining standard of living. GDP growth was further affected by the suspension of oil exports for six months in 1987 as a result of earthquake damage. The economic crisis has had serious implications for the population, particularly the poor. Although unemployment grew by only a fraction in this three-year period (from 10.5 to 10.8 percent), underemployment is estimated at 50 percent, or approximately one million people (PAHO). In 1989, inflation exceeded 90 percent, up from a cumulative annual rate of less than 30 percent (through 1987), further eroding the standard of living.

Ecuador's population was estimated at 11 million in 1990, and, despite a decline, continues to grow at a rate of about 2.7 percent. This continued growth affects the quality and availability of housing. In 1982, there were an estimated 1.8 million dwellings and a deficit of 690,000 housing units; in 1986, with approximately 2.1 million dwellings, the housing shortage was estimated at 885,000 units (PAHO). Population growth also hinders Ecuador's ability to provide water and sanitation services.

Intestinal infectious diseases, followed by respiratory infections, are the leading causes of death. Diarrheal diseases and respiratory infections together are responsible for 50 percent of infant mortality. Malnutrition also contributes significantly to infant and child mortality, weakening the immune systems of poor children exposed to environmental hazards such as unsafe water. Although mortality rates have declined over the past decade, they remain high: 60/1,000 infants and 25/1,000 for children under five.

COUNTRY PROFILE

1990 Population:	10.78 million
	Urban: 5.98 million
	Rural: 4.80 million
Population Growth Rates:	Rural: 1.1%
	Urban: 3.9%
Infant Mortality Rate:	51
Under 5 Mortality Rate:	81
Mortality Rate due to Infectious and Parasitic Diseases:	62.5
Mortality Rate due to Diarrheal Diseases:	35.5
Life Expectancy:	Female: 68
	Overall: 66
Adult Literacy Rate:	82%
GNP per Capita (1988):	\$1,120
GNP per Capita (1989):	\$1,020
GNP per Capita Annual Growth from 1965-88:	3.1%
Currency:	1,023 sucres = \$1
Average Annual Inflation from 1980-88:	31.2%

The population with access to water supply and sanitation services has increased substantially over the past decade but remains well below targets established by WASH and the GOE. As in Bolivia and Peru, Ecuador faces serious pollution problems associated with water and sanitation. Sewerage and industrial waste have contaminated most of the country's watersheds.

The Instituto Ecuatoriano de Obras Sanitarias (IEOS), a division of the Ministry of Health, is the chief agency responsible for water and sanitation. It is in charge of national planning and developing standards and providing technical assistance to other agencies working in the sector, including municipal governments. Another national agency, the Instituto Ecuatoriano de Recursos Hidráulicos, is responsible for managing water resources, including irrigation, watersheds, rivers, and ocean shorelines. Ecuador's National Development Council services as an institutional bridge between the national government's planning functions and the various organizations working in the sector.

BEDE, the Ecuadorian Development Bank, is the primary financial channel for local and national infrastructure activities. Although it has been involved in evaluating and financing some infrastructure development projects in the sector at this time it has limited capacity to provide technical and financial assistance to other entities in the sector.

At the local level, municipal governments provide water and sanitation services to residents. Larger cities have their own water and sewerage companies, which in some cases also manage utility service in surrounding rural areas.

COVERAGE LEVELS AND INVESTMENT

Current Projects

- **A.I.D.**

A.I.D.'s \$22 million Water and Sanitation for Health/Ecuador Development Project, begun in 1989 and planned for completion in 1993, seeks to improve the health of infants and children in rural Ecuador. Its objectives are to install cost-effective water and sanitation systems and educate communities to use and maintain them, as well as to strengthen the institutional capability of IEOS to assist rural communities in eight provinces. The GOE and beneficiary communities will invest approximately \$18 million, and A.I.D. will provide \$4 million. Overall, this project is intended to support water and sanitation projects in 640 communities and to benefit approximately 320,000 persons.

A.I.D. is also assisting the construction of urban water and sanitation facilities with \$35 million in Housing Guaranty loans through its National Shelter Delivery System Program, which supports a broad range of public and private initiatives to improve living conditions of low-income urban families.

Of these funds, an estimated \$12 million will be devoted to providing water and sanitation services. The Ecuadorian Housing Bank (BEV by its Spanish acronym), working with municipal infrastructure agencies, will be primarily responsible for implementing the program. Private financial institutions will provide direct financing for the project. The Shelter program began in September 1989 and is expected to serve over 42,000 urban families when completed at the end of 1995. WASH has included estimates of the balance remaining under this program and the water and sanitation component of the health project in the pool of funding to expand coverage.

Total funding committed to expand coverage: \$17,000,000

- **CARE**

CARE's Community Water System Construction Project seeks to train and supervise community groups in the southern Andean region in the construction of clean water systems. The project will benefit 9,000 rural residents in the provinces of Azuay and Loja. Funding in 1991 will come from the Dutch (\$137,911) and ETAPA, Cuenca's municipal water, sewerage and telephone company (\$24,836).

Total funding committed to expand coverage: \$162,747

- **Government of France**

The French government signed a \$28.3 million loan agreement in 1989 for infrastructure development in eight mid-sized cities. It includes financing for water and sanitation service improvement and expansion and is being implemented by IEOS. WASH has estimated that 10 percent of the funds remaining under the project will be used to increase coverage.

Total funding committed to expand coverage: \$2,200,000

- **Government of Spain**

The Spanish government is providing \$15 million in technical assistance for the construction of a chlorine plant for water treatment. Since this will not directly affect service expansion, it has not been included in the investment analysis.

Total funding committed to expand coverage: \$0

- **IDB**

A \$28 million IDB loan is financing a project to expand and improve Quito's water supply which began in 1984 and is scheduled to be completed in 1991. In addition, the project covers designs for the next phase of the project which will be assisted by financing from Argentina and Italy. This phase, expected to begin in 1992, will involve the construction of new intake and transmission lines from reservoirs to the city and will cost an estimated \$60 million, of which approximately \$48 million will be in IDB financing. Phase II funding has not yet been approved.

The IDB recently approved a direct loan of \$50 million to the city of Cuenca to finance improvements and expansion of its water supply and sewerage systems. The loan will be supplemented by \$6.6 million in counterpart funds from the city. The increased capacity should be adequate to meet the water and sanitation service demands in Cuenca until the year 2000. The project, which began at the end of 1990, is expected to be completed in 1994.

As a follow-up to recently completed activities in Guayaquil, Ecuador's most populous city, the IDB plans to begin the first phase of the Sewerage Master Plan for Guayaquil Project in 1993. The \$60 million project, with \$45 million in IDB funds, will focus on the western suburbs.

WASH estimates that 10 percent of both the Cuenca loan and the funds remaining under Phase I of the Quito project will be applied to expand coverage. Although additional IDB collaboration is being discussed, no other firm commitments have been made and no other projects are included in the funding analysis.

The IDB is also providing loans to support an infrastructure development project jointly funded by the World Bank and GTZ. This project (and its implications for the investment analysis) is further discussed in the World Bank section.

Total funding committed to expand coverage: \$6,000,000

- **Government of Germany**

Germany's KfW is preparing a \$3 million loan for the rehabilitation and extension of the water supply and sewerage systems of Santo Domingo. Another loan of \$6.5 million will likely be approved to support a basic health program in the southern departments of Loja and Zamora. This project, in the final design stage, will involve the installation of latrines and water supply and sewerage systems. Neither of these loans has been firmly committed.

The GTZ is a partner in a municipal development project funded jointly with the IDB and World Bank. This project is described in detail in the World Bank section.

Total funding committed to expand coverage: \$0

- **PAHO**

PAHO is providing technical assistance to the IEOS in the management of water and sanitation systems in the cities of Guayaquil and Cuenca through training in the operation and maintenance of treatment plants and fellowships for IEOS staff to learn water laboratory management and water quality standardization. PAHO is also providing assistance for a research center within the IEOS. Funding for these efforts totals approximately \$200,000.

Total funding committed to expand coverage: \$0

- **UNDP**

The UNDP has provided \$675,000 to the municipality of Quito for studies to improve the living conditions of marginal groups by extending and improving public services to them. Under the three-and-a-half-year project begun in 1988, UNDP technical experts collaborate with the local and central government, as well as with residents of marginal communities and their organizations. The project aims to support institutional formulation of policies and the programming of activities to promote community participation in the development and construction of services, including water, sanitation, transportation, and education. UNDP experts are also assisting in the transfer of knowledge in areas such as finance and management to government and community institutions.

Total funding committed to expand coverage: \$0

- **World Bank**

Despite several years of delay, the World Bank resumed in 1992 the \$55 million Guayaquil Water Supply and Sanitation Project, which is intended to improve and expand the water distribution system. The project involves the expansion of production facilities, construction and metering of new connections, rehabilitating the existing system, strengthening the institutional capabilities of the municipal water company, Empresa Provincial de Agua Potable de Guayaquil (EPAP-G), and combining the water supply and sewerage companies into a single operation.

Disbursements under the project, which was originally scheduled to begin in 1986, were suspended as a result of a lack of compliance with loan covenants and change in the executing

agency. The loan was originally negotiated with Empresas Municipales de Agua Potable de Guayaquil (EMAP) and has been renegotiated with its successor, EPAP. Execution of the physical work under the project is now progressing satisfactorily. However, institutional improvements have not been made. EPAP-G needs to strengthen its financial and commercial activities. The project's original financing plan entailed \$20 million in government funds, approximately \$8 million from the Commonwealth Development Corporation, and the balance from the Bank Loan. As much of this project focuses on rehabilitation, off-site facilities, and institutional development, 30 percent of this \$50 million project (\$15 million) has been included in the WASH investment analysis.

In 1991, a six-year, \$300 million municipal development and urban infrastructure project funded in part by the World Bank, the IDB and the GTZ was initiated. The project, which is being implemented by BEDE, will finance sub-loans to municipalities and regional utilities for public works development and equipment as well as for technical assistance and training. Along with BEDE, FONAPRE, the National Investment Fund, is responsible for hiring consultants and supervising the preinvestment studies requested by BEDE's sub-borrowers; SENDA, the National Secretariat of Administrative Development, is responsible for coordinating municipal training programs.

The project's objectives include the improvement of cost recovery and income generation within municipalities, the improvement of institutional development and training activities, and improved targeting of benefits to low-income populations. Eighty percent of the project's beneficiaries are intended to be from low-income groups. Although cost recovery is a priority, sub-projects (or components of sub-projects) targeted to low-income populations will be subsidized to ensure that they remain affordable and accessible. In addition, each sub-project proposed for funding will be systematically screened for potential negative environmental impact.

Seventy-one percent of the funding for this project is being provided by the World Bank (\$104 million in loans), the IDB (\$104 million) and the GTZ (\$4 million grant), with the balance provided by the Government of Ecuador (\$88 million). Most of these funds—\$273 million—will be used for infrastructure development (such as water and sewerage development, storm drainage, solid waste management and roads). Another \$27 million will be used for institutional development and training, and \$25 million for feasibility studies and the monitoring and auditing of sub-projects.

A total of 194 applications for sub-projects to be implemented in the project's first year were screened, of which 24 were selected. The profile of these projects is: eight sub-projects in water and sanitation, at a total cost of \$24.8 million; three solid waste projects, at \$5 million; six road and bridge projects at \$8.2 million; and six community and neighborhood improvement projects, at \$5 million. Water and sanitation projects comprise 58 percent of the projects initiated in the first activity.

Estimating that water and sanitation projects will continue to comprise at least 50 percent of the \$273 million committed for infrastructure development, approximately \$136 million will be provided for activities in the sector. Of this total, given the project's focus on meeting basic necessities, for the purpose of this analysis WASH has estimated that 60 percent will directly expand water and sanitation coverage. Funding from this project estimated to expand coverage is as follows: World Bank \$28.4 million; IDB \$28.4 million; GTZ \$1.1 million; GOE \$24 million.

Total funding committed to expand coverage: \$96,900,000

Current Coverage

In 1990, an estimated 66 percent of Ecuadorians had adequate access to drinking water and 64 percent to sanitation. As illustrated in Tables B-1 and B-2, both urban and rural areas in Ecuador have seen substantial expansion in water and sanitation services over the past decade. In urban areas, water coverage has grown to reach an additional 1,930,000 users and sanitation services are available to an additional 2,098,000. But with an urban population growth of 2,659,000, the percentage of the population with water service has increased by only 4 percent to 83 percent, and with sanitation facilities, by only 9 percent to reach 82 percent. Rural areas, where population growth is lower as a result of massive urbanization, have seen greater advances in percentage coverage. Rural water coverage has advanced from 20 percent in 1980 to 45 percent in 1990 (1,307,000 persons) and sanitation coverage from 17 to 42 percent (1,272,00 persons).

Annual increases have been impressive, with increases of 618,000 in water coverage (351,000 in urban areas) and 640,000 in sanitation coverage (398,000 in urban areas) during the last year. These gains have outstripped the population increase, which was approximately 297,000 in the past year. Nonetheless, with continued population growth, Ecuador faces a formidable task in providing adequate coverage.

Meeting the 1995 Urban Water and Sanitation Targets

WASH objectives for urban coverage are 84 percent for water (a one-point gain) and 85 percent for sanitation (a three-point gain). Although these percentage increases are relatively small, they require the extension of water services to 1,128,000 and sanitation facilities to 1,253,000 additional urban residents. The water target is shown in Table B-1 and the sanitation target in Table B-2.

Of the \$122 million estimated to be currently committed to extend services, \$109 has been allocated for urban development. Although this amount illustrates the existence of a substantial disparity in the distribution of current commitments between urban and rural zones, this

amount is still short of the \$160 million necessary to achieve the WASH targets. As Table B-3 illustrates, Ecuador faces a deficit of \$51.8 million in the urban subsector, with \$21.1 million needed for additional water service and \$30.7 million for sanitation.

Meeting the 1995 Rural Water and Sanitation Targets

WASH's rural water target of 52 percent calls for a 7 percent gain over the current service level, or the addition of 472,000 new users, and the sanitation target of 51 percent, for available facilities to 585,000 more persons (Tables B-1 and B-2).

External investments in water and sanitation development in rural Ecuador are few. A.I.D. and CARE have provided a total of \$12.7 million—6.5 million for water and \$6.2 million for sanitation. In order to reach the WASH targets, approximately \$72 million is needed over the next five years. Thus Ecuador faces a \$59 million shortfall (Table B-3). This deficit is particularly acute, given that the WASH targets would extend coverage to just over half the rural population—a level which is certainly inadequate in light of the morbidity and mortality associated with waterborne diseases in Ecuador.

Table B-1**Actual Water Supply Coverage vs. Targets**

WATER SUPPLY									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	8,123	3,881	48%	3,825	3,021	79%	4,298	860	20%
1986	9,365	5,264	56%	4,812	3,898	81%	4,553	1,366	30%
1988	9,908	5,829	59%	5,248	4,198	80%	4,660	1,631	35%
1989	10,485	6,500	62%	5,724	4,600	80%	4,761	1,900	40%
* 1990	10,782	7,118	66%	5,977	4,951	83%	4,805	2,167	45%
TARGETS FOR 1995	12,312	8,718	71%	7,237	6,079	84%	5,075	2,639	52%

Population figures are rounded to the nearest thousand

* 1990 coverage figures are WASH projections

Table B-2**Actual Sanitation Coverage vs. Targets**

SANITATION									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	8,123	3,531	43%	3,825	2,800	73%	4,298	731	17%
1986	9,365	4,980	53%	4,812	3,705	77%	4,553	1,275	28%
1988	9,908	5,603	57%	5,248	4,112	78%	4,660	1,491	32%
1989	10,485	6,260	60%	5,724	4,500	79%	4,761	1,760	37%
* 1990	10,782	6,900	64%	5,977	4,898	82%	4,805	2,003	42%
TARGETS FOR 1995	12,312	8,729	71%	7,237	6,151	85%	5,075	2,588	51%

Population figures are rounded to the nearest thousand

* 1990 coverage figures are WASH projections

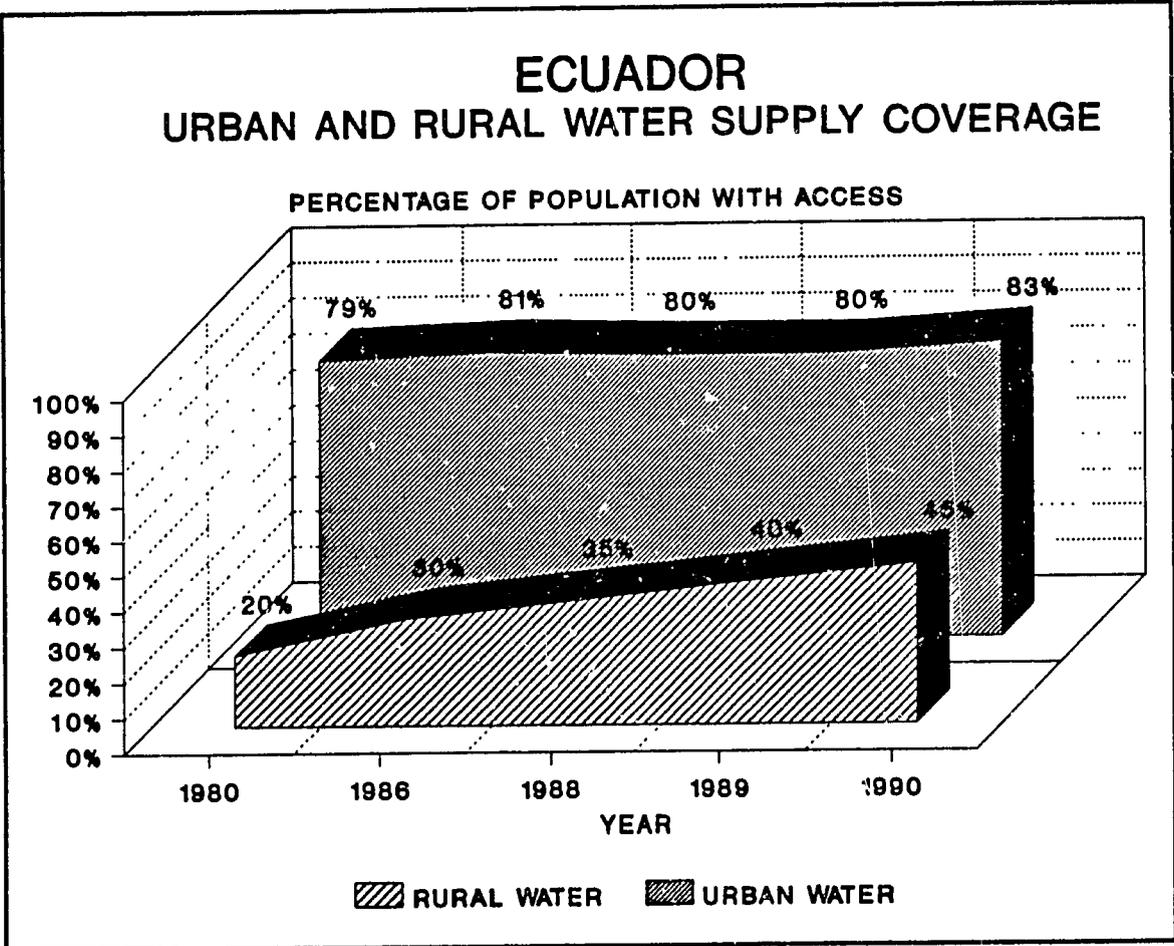


Figure B-1

ECUADOR URBAN AND RURAL SANITATION COVERAGE

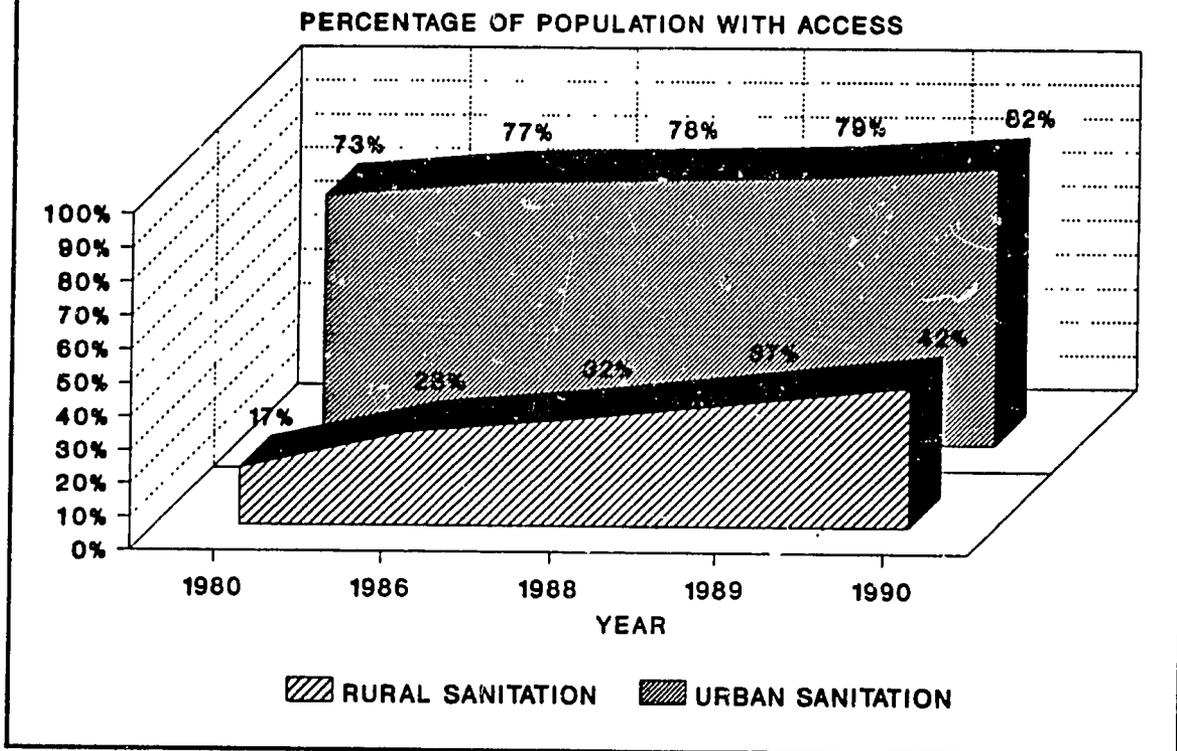


Figure B-2

Table B-3

**Investment Needed to Meet 1995 Targets
(1990 US \$000s)**

	WATER SUPPLY COVERAGE (PERSONS-000s)			SANITATION COVERAGE (PERSONS-000s)		
	TOTAL	URBAN	RURAL	TOTAL	URBAN	RURAL
TARGET FOR 1995 (000s)	8,718	6,079	2,639	8,739	6,151	2,588
COVERAGE IN 1990	7,118	4,951	2,167	6,901	4,898	2,003
REQUIRED INCREASE	1,600	1,128	472	1,838	1,253	585
ESTIMATED UNIT COSTS (US \$ PER CAPITA)	N/A	\$66	\$63	N/A	\$69	\$72
ESTIMATED TOTAL COST TO MEET 1995 TARGETS	\$104,184	\$4,448	29,736	128,577	86,457	42,120
FIRMLY COMMITTED INVESTMENTS (000s)*	\$59,801	\$53,351	\$6,450	\$62,462	\$55,749	\$6,713
PROJECTED FUNDING SHORTFALL (\$000s)	\$44,383	21,097	23,286	66,115	30,708	35,407

TOTAL FUNDING SHORTFALL \$110,498

*Includes only those investments to increase coverage.

ECUADOR 1990 COVERAGE AND TARGETS (# PEOPLE)

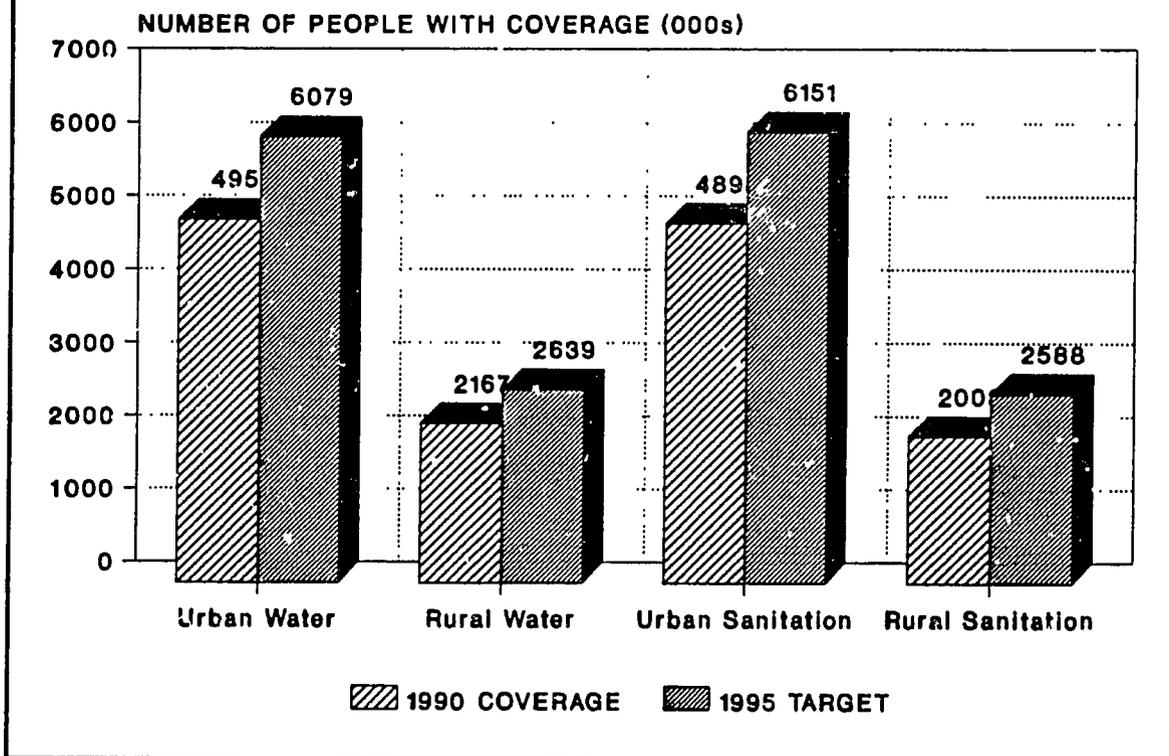


Figure B-3

EQUADOR

1990 COVERAGE AND TARGETS (% OF POP.)

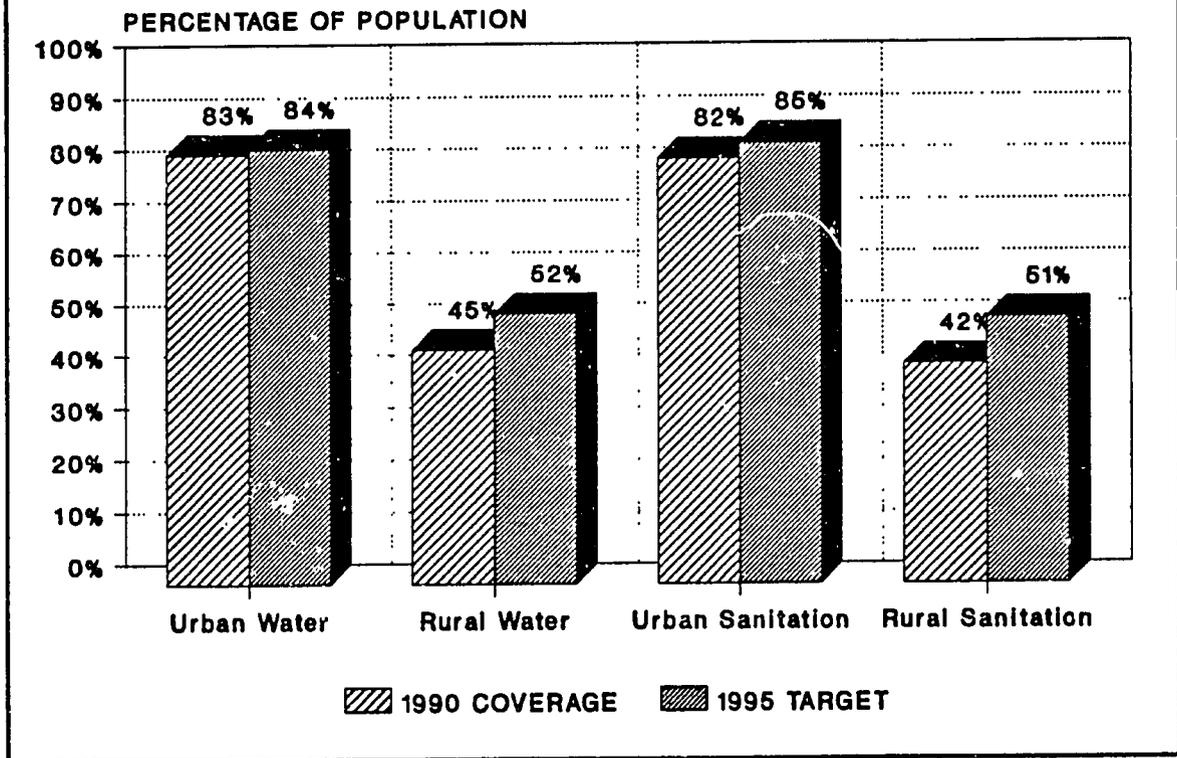


Figure B-4

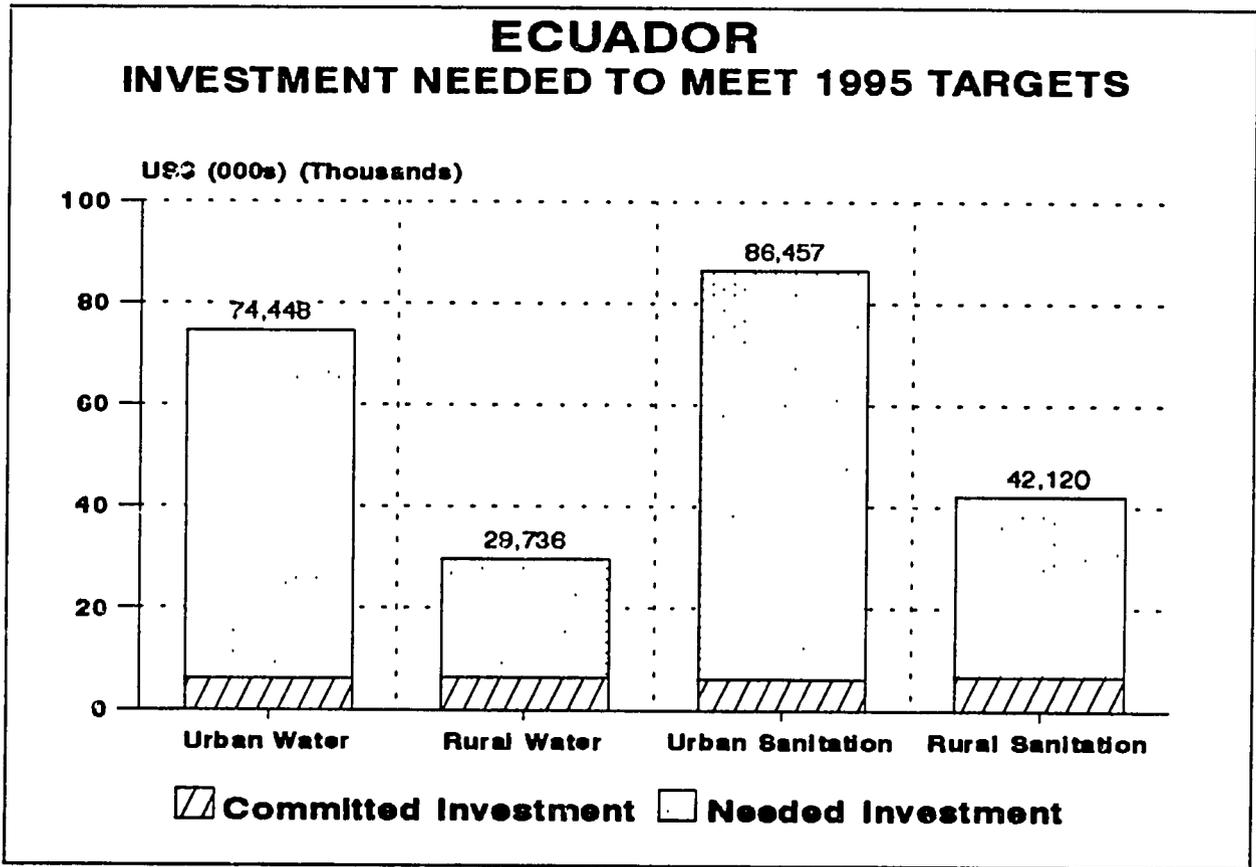


Figure B-5

APPENDIX C

PERU

COUNTRY BACKGROUND

Peru is in the midst of a socioeconomic crisis that began in 1975. Recent estimates (1988) from PAHO place unemployment at 13 percent, inflation at well over 1000 percent, and per capita GDP growth at -9.6 percent. The economic crisis is complicated by political polarization, violence from guerilla revolutionary groups, and drug trafficking. Under the Government's August 1985 Economic Emergency Plan, the nation limited debt service payments to 10 percent of total export earnings. As a result of mounting arrears, international financial organizations have suspended both existing loans and plans for new lending.

This has affected Peru's ability to finance development activities, including those in water supply and sanitation services.

Diseases related to poor environmental health conditions are prevalent among infants and children. According to PAHO, in 1987 acute respiratory infections accounted for 57.9 percent of diseases reported in children under one year, and diarrheal disease accounted for 37.8 percent. Among children between one and four, these diseases represented 51.9 percent and 30.8 percent, respectively, of reported cases. They are also prevalent among older children (ages 5 to 14).

The development of water supply and sanitation facilities has been outpaced by population growth and urbanization. In 1990, an estimated 53 percent of Peruvians had adequate access to water supplies and 38 percent to sanitation facilities. These figures represent a decline in the percentage of the population served in previous years.

The National Committee for Basic Sanitation (CONCOSAB-Comité Nacional de Saneamiento Básico) was created in 1982 to draft and coordinate the implementation of a 10-year National Plan for Basic Sanitation (PLANSAB), which represented Peru's participation in the U.N. Decade of Water Supply and Sanitation. CONCOSAB, an autonomous inter-ministerial

COUNTRY PROFILE	
1990 Population:	21.55 million
	Urban: 15.05 million
	Rural: 6.50 million
Population Growth Rates:	Rural: .09%
	Urban: 3.3%
Infant Mortality Rate:	81
Under 5 Mortality Rate:	107
Mortality Rate due to Infectious and Parasitic Diseases:	101.1
Mortality Rate due to Diarrheal Diseases:	48.8
Life Expectancy:	Female: 64
	Overall: 62
Adult Literacy Rate:	85%
GNP per Capita (1988):	\$1,300
GNP per Capita (1989):	\$1,010
GNP per Capita Annual Growth from 1965-88:	.1%
Currency:	New Sol .61 = \$1
Average Annual Inflation from 1980-88	119.1%

committee, has coordinated the preparation of the PLANSAB for 1986-1995 for both urban and rural areas. The actual implementation of these activities is the responsibility of the Ministry of Housing and Construction (MOHC) and the Ministry of Health (MOH). These two ministries have coordinated the technical and financial contributions of national and foreign donors to support development in the sector.

The MOHC is responsible for urban water and sewerage in cities and towns with populations of 2,000 or more. It operates through a number of subsidiary and affiliate agencies. SENAPA (Servicio Nacional de Agua Potable y Alcantarillado) is responsible for determining policies, establishing technical guidelines, and providing technical assistance to affiliate agencies, operating units, and municipal water and sanitation authorities. These institutions operate under SENAPA's overall policy guidance but retain technical, financial, and administrative autonomy. SEDAPAL (Servicio de Agua Potable y Alcantarillado de Lima) is SENAPA's affiliate responsible for water and sewerage services in Lima and Callao. Other SENAPA affiliate agencies and operating units are responsible for services in other departments and cities. In addition, the Dirección General del Medio Ambiente (General Directorate for the Environment) is responsible for policies and programs to improve and monitor the quality of the environment in the shanty towns around major urban areas. Another agency, CORTAPA (the Commission to Regulate Tariffs for Potable Water and Sewerage), is responsible for determining, authorizing, and updating monthly fees for water and sewerage services in urban areas.

Water and sanitation services in rural areas and towns with populations of less than 2,000 are the responsibility of the MOH. Like the MOHC, the MOH operates through several agencies. Policies and technical guidelines for all MOH environmental activities throughout Peru are established by INAPMAS, the National Institute for the Protection of the Environment and Health. INAPMAS also serves as a clearinghouse and coordinating office for all MOH environmental health activities. The General Directorate of Environmental Sanitation (Dirección General de Saneamiento Ambiental—DIGESA) provides professional staff resources in a broad range of technical fields. The staff plans and implements studies, training courses, and environmental sanitation projects financed by the GOP and various foreign donors. DISABAR, the Division of Basic Rural Sanitation, is responsible for providing water and sanitation services for the communities served by the MOH. DISABAR plans, designs, and implements small water and sanitation projects throughout the country, using its central Lima office and 18 regional offices within a decentralized technical and administrative system. Under the ongoing regionalization process, DISABAR's regional offices are being transferred to the newly created regional governments. The GOP may also transfer the central Lima office to the MOHC.

COVERAGE LEVELS AND INVESTMENT

Current Projects

- **A.I.D.**

A.I.D. has no ongoing water and sanitation projects but plans one in early 1992 to expand coverage and improve the quality of water and sanitation. This project will follow some of the recommendations in a water and sanitation master plan scheduled for completion in 1991.

Total funding committed to expand coverage: \$0

- **CARE**

CARE is executing a water and health project to help the 11,270 residents of 23 communities establish irrigation systems and improved water supplies. It is also working to increase health awareness, especially among mothers. CARE/Canada is funding this effort, with \$248,890 in local funds and \$51,110 in central funding in 1991. Given the project's focus on irrigation and health education, WASH estimates that 50 percent of the funds will provide water supplies to the target communities.

Total funding committed to expand coverage: \$150,000

- **CIDA**

CIDA supports a water and sanitation project implemented by WUSC in pueblos jovens (barrios, or shanty towns) in the urban areas of Lima, Ica, and Trujillo, and in rural communities in Palpa. The project seeks to provide water and sanitation systems in selected urban barrios and rural communities, together with training in hygiene and system operation and maintenance. This four-year project, commenced in 1988, is a continuation of WUSC's water program begun in the 1980s. Planned project outputs are 9,625 sewage connections, 841 latrines, and 15 standpipes servicing a target population of approximately 70,470. Funding for the project totals \$4.8 million.

Total funding committed to expand coverage: \$1,800,000

- **Government of Germany**

In July 1989, the German government began the second phase of a water and sanitation pilot project to rehabilitate and expand water supply and sanitation facilities in the towns of Trujillo,

Ica, and Pisco. Executed by SENAPA, the project is scheduled to terminate in 1992 and focuses primarily on rehabilitation and on strengthening SENAPA's institutional capacity. GTZ and the GOP are looking to this pilot project to provide a model for water and sanitation expansion in medium-sized cities. Funding for this effort totals \$5.3 million, \$3.2 million of which is being provided by the GTZ and \$2.1 million by the Peruvian government. Only 10 percent of the estimated remaining funds are included in this analysis.

Phase II of a GTZ-funded solid waste management project in Lima ended in September 1990. The main goal of the \$1,665,000 project was to implement and institutionalize the disposal of solid waste through environmentally sound methods. It provided technical assistance and training seminars in waste disposal and financed studies and materials for the institutional strengthening of the Empresa de Servicios de Limpieza de Lima (ESMLL). The project also involved the expansion of the system of pricing and billing. Although some activity remains, this project is essentially complete.

Through KfW, the German government is financing the first stage of the extension of the water supply and sewerage system of the city of Arequipa through a \$13 million loan. A study of the second stage, which began in 1986, is currently being implemented. KfW has committed \$1.1 million for this activity.

Total funding committed to expand coverage: \$6,765,000

- **IDB**

The GOP is in the process of delegating responsibility for the operation and maintenance of water and sanitation systems to regional and municipal water authorities. Contingent upon the success of this restructuring of the sector is the planned \$200 million Global Credit Program, under which the IDB will provide funds to a central unit with authority to lend to local operating institutions. Development will focus on operational improvements, rehabilitation, and expansion. At this time, the roles of the former national water authority, SENAPA, and the potential role of the Banco de la Vivienda, the national housing finance authority, are unclear. Because of the nature of the project, scheduled to start in 1992, it is difficult to predict the number of sites and the size of the population to be served. Since no firm commitments have been made, the project is not included in the analysis.

Total funding committed to expand coverage: \$0

- **JICA**

JICA, the Japanese government's international development assistance agency, is providing technical and financial support to SENAPA for several water and sanitation projects in urban

and peri-urban areas across the country. Details of these projects were not available, but among them are solid waste management improvement in Lima and the improvement and expansion of water and drainage facilities in Chosica and Chaclacayo.

Total funding committed to expand coverage: \$0

- **PAHO**

A two-year PAHO project is seeking to improve sanitary and environmental conditions through institutional development at the local, regional, and national levels. SENAPA and local institutions in Trujillo, Ica, and Pisco are being assisted. The project will strengthen the information network for the sector and provide research on water consumption.

PAHO is also conducting several small projects to provide water to poor urban populations in Lima and other cities. The recent outbreak of cholera has heightened the importance of these efforts.

Total funding committed to expand coverage: \$0

- **Government of Peru**

The GOP's 1991 budget includes the following allocations for DISABAR's rural water and sanitation activities:

Potable Water Supply Program:	\$147,143
Latrine Construction Program:	14,714
Sewerage Construction Program:	4,714
Water Systems Rehabilitation:	71,714
Total Funding:	\$238,285

Although a similar level of funding is likely in future years, that funding has not been firmly committed and is not included in the funding analysis.

These funds supplement the normal operating budgets for Peru's water agencies, and are separate from monies allocated as counterpart funding for externally-assisted programs. Information on such national programs was not available for Ecuador and Bolivia. However, the size of the budget for Peru's national activities illustrates that although these funds have

been excluded in the other countries, they would likely have a small effect on the investment analysis.

Total funding committed to expand coverage: \$166,571

- **World Bank**

As a consequence of escalating debt and the country's inability to service its loans, the World Bank canceled its most recent water and sanitation project in Peru in June 1989. It is now considering support for the Lima Water Supply Project, but project plans are not complete and the loan has not been approved.

Total funding committed to expand coverage: \$0

Current Coverage¹

Inadequate safe water supplies and basic sanitation facilities, combined with the poor quality of the existing infrastructure, are responsible for the widespread incidence of infectious waterborne diseases.

With 61 percent coverage in water and 51 percent coverage in sanitation, Peruvians have the lowest access to adequate water supply and sanitation facilities in the region. In urban areas, only 75 percent of the population has access to water and 62 percent to sanitation. Rural coverage in 1990 stood at 30 percent for water and 23 percent for sanitation. While rural coverage is comparable with that in the other countries in the region, urban coverage is significantly lower and explains why the urban population proved highly vulnerable to the spread of cholera in the recent epidemic.

Over the past year, Peru has made relatively small advances in the sector, with coverage increasing by only 1 percent in water and 6 percent in sanitation. Overall, water coverage has increased by 13 points (from 48 to 61 percent) and sanitation by 16 points (from 35 to 51 percent) in this decade. In terms of numbers, water service has been provided to an additional 5,121,000 and sanitation facilities to an additional 5,032,000 persons. Although these are substantial achievements, they have barely outpaced the population growth of 4,735,000 for the same period.

With 25 million inhabitants, Peru is more than twice as populous as Ecuador and more than three times as populous as Bolivia. Because of the size and continued rapid growth of its

¹ Data for 1990 have been obtained from the UNDP and differ slightly from the trend shown in previous years.

population, substantially larger commitments are needed to progress toward the ultimate goal of full coverage by 2020, and to avert future health crises linked to a weak water and sanitation infrastructure.

Meeting the 1995 Urban Water and Sanitation Targets

WASH has set targets of 84 percent for water coverage (a 9 percent increase) and 69 percent for sanitation coverage (a 7 percent increase) for urban populations. These objectives mean providing adequate access to water to more than 3.5 million and sanitation services to more than 2.8 million urban dwellers at an estimated cost of \$491 million. With only \$8.5 million firmly committed to extend urban services through 1995, Peru cannot possibly reach the WASH targets.

Meeting the 1995 Rural Water and Sanitation Targets

Rural targets have been established at 40 percent for water and 36 percent for sanitation, calling for increases of 10 and 13 percent, respectively. Peru's rapid urbanization means that these percentage increases, though larger than those for urban areas, translate into relatively small numbers of people: 874,000 for water and 944,000 for sanitation.

According to WASH estimates, Peru must invest a little more than \$61 million to achieve these increases. Only \$317,000 in external assistance is currently allocated to rural water and sanitation service expansion, leaving a deficit of \$60,927,000 which, though substantial, is relatively small compared with the urban shortfall. It is important to note that the WASH targets would still leave coverage at unsatisfactory levels, and that, as obvious as the need is to focus on developing urban water and sanitation infrastructure, rural areas cannot be neglected.

Table C-1**Actual Water Supply Coverage vs. Targets**

WATER SUPPLY									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	16,815	8,129	48%	10,205	6,919	68%	6,610	1,210	18%
1986	19,698	10,344	53%	12,546	9,148	73%	7,152	1,196	17%
1988	21,256	12,422	58%	13,890	10,779	78%	7,366	1,643	22%
1989	21,823	13,050	60%	14,376	11,250	78%	7,447	1,800	24%
* 1990	21,550	13,250	61%	15,053	11,306	75%	6,497	1,944	30%
TARGETS FOR 1995	24,501	17,591	72%	17,706	14,873	84%	6,795	2,718	40%

Population figures are rounded to the nearest thousand.

* 1990 estimates are based on data from the UNDP's Human Development Report 1991.

Table C-2**Actual Sanitation Coverage vs. Targets**

SANITATION									
YEAR	TOTAL POP.	ALL AREAS		URBAN AREAS			RURAL AREAS		
		POP. SERVED	% OF POP. SERVED	TOTAL URBAN POP.	POP. SERVED	% OF POP. SERVED	TOTAL RURAL POP.	POP. SERVED	% OF POP. SERVED
1980	16,815	5,868	35%	10,205	5,844	57%	6,610	24	0%
1986	19,698	9,299	47%	12,546	8,408	67%	7,152	891	12%
1988	21,256	9,663	45%	13,890	8,440	61%	7,366	1,223	17%
1989	21,823	9,800	45%	14,376	8,451	59%	7,447	1,350	18%
* 1990	21,550	10,900	51%	15,053	9,398	62%	6,497	1,502	23%
TARGETS FOR 1995	24,501	14,663	60%	17,706	12,217	69%	6,795	2,446	36%

Population figures are rounded to the nearest thousand.

* 1990 estimates are based on data from the UNDP's Human Development Report 1991.

PERU URBAN AND RURAL WATER SUPPLY COVERAGE

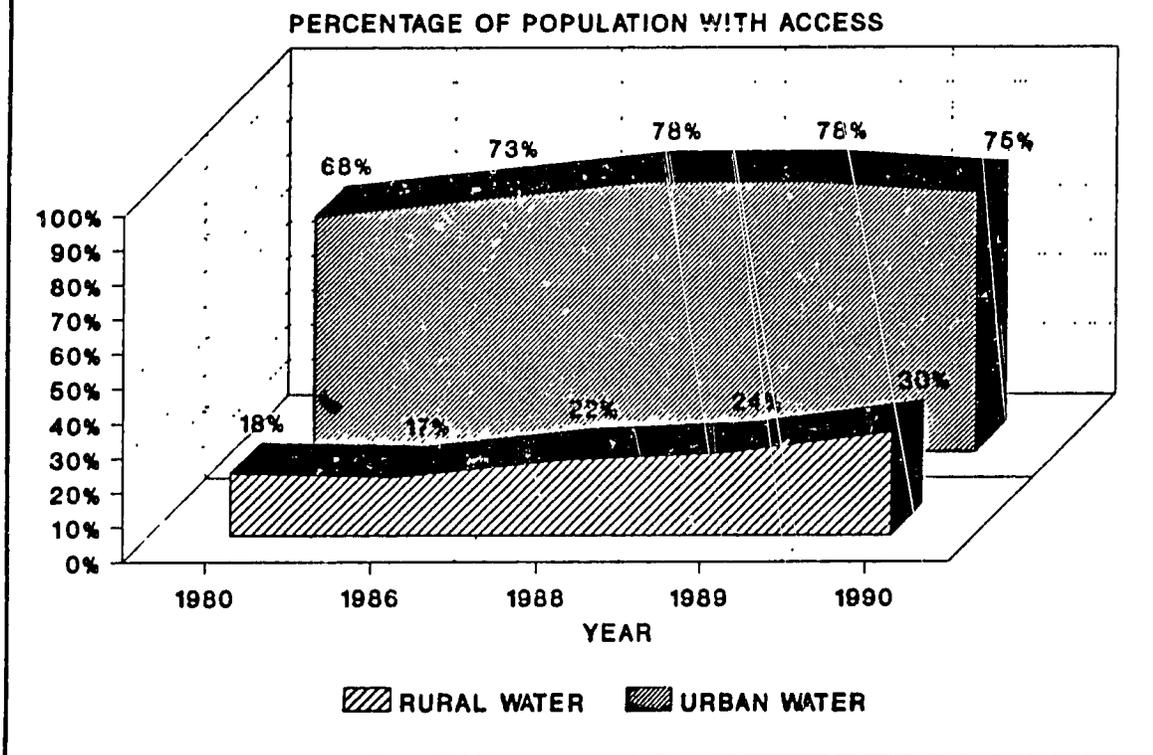


Figure C-1

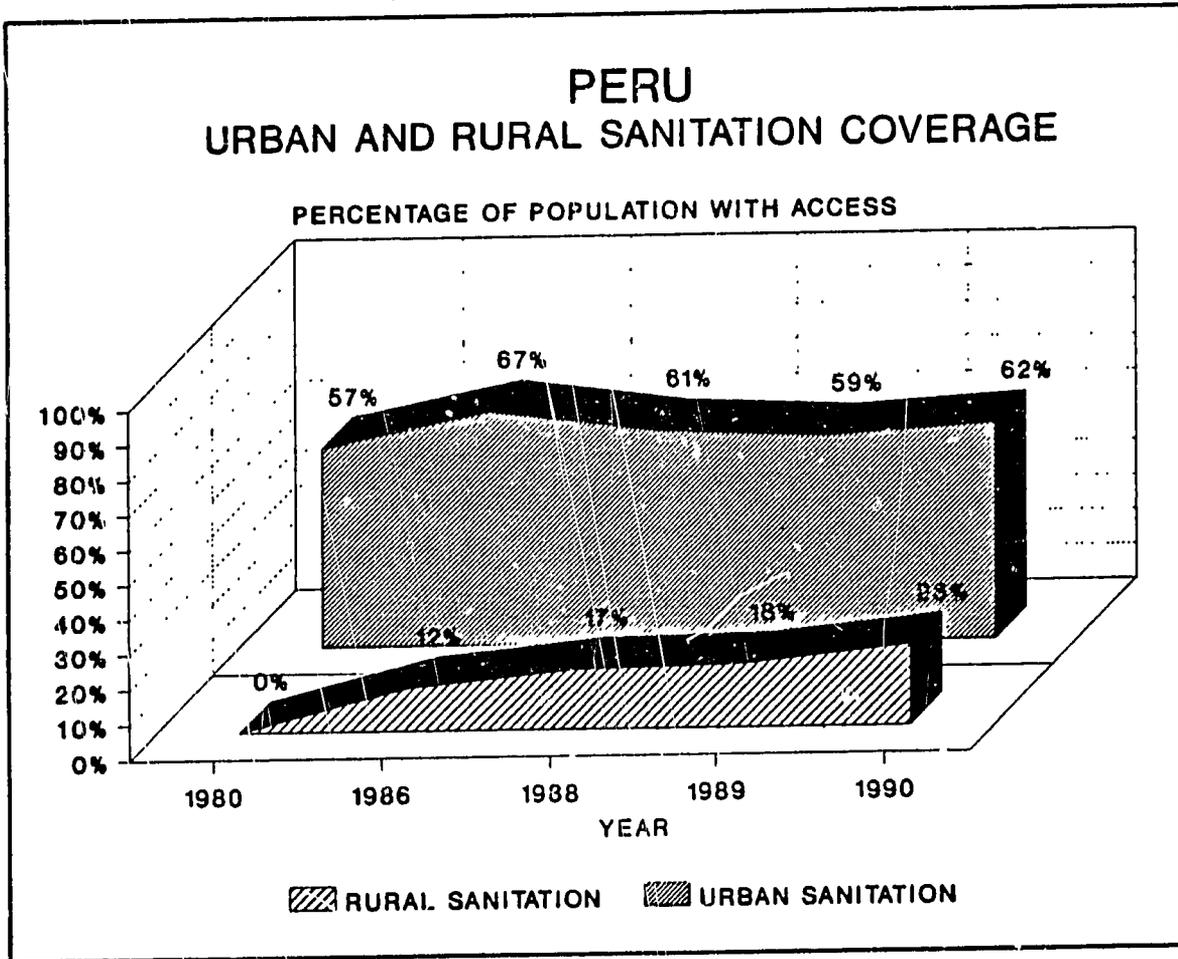


Figure C-2

Table C-3

**Investment Needed to Meet 1995 Targets
(1990 US \$000s)**

	WATER SUPPLY COVERAGE (PERSONS—000s)			SANITATION COVERAGE (PERSONS—000s)		
	TOTAL	URBAN	RURAL	TOTAL	URBAN	RURAL
TARGET FOR 1995 (000s)	17,591	14,873	2,718	14,663	12,217	2,446
COVERAGE IN 1990	13,250	11,306	1,944	10,900	9,398	1,502
REQUIRED INCREASE	4,341	3,567	774	3,763	2,819	944
ESTIMATED UNIT COST (US \$ PER CAPITA)	N/A	\$76	\$34	N/A	\$78	\$37
ESTIMATED TOTAL COST TO MEET 1995 TARGETS	\$297,408	271,092	26,316	254,810	219,882	34,928
FIRMLY COMMITTED INVESTMENTS (000s) *	\$4,457	\$4,227	\$230	\$4,425	\$4,338	\$87
PROJECTED FUNDING SHORTFALL (\$000s)	\$292,951	266,865	26,086	250,385	215,544	34,841

TOTAL FUNDING SHORTFALL \$543,336

* Includes only those investments to increase coverage

PERU 1990 COVERAGE AND TARGETS (# PEOPLE)

NUMBER OF PEOPLE WITH COVERAGE (000s)

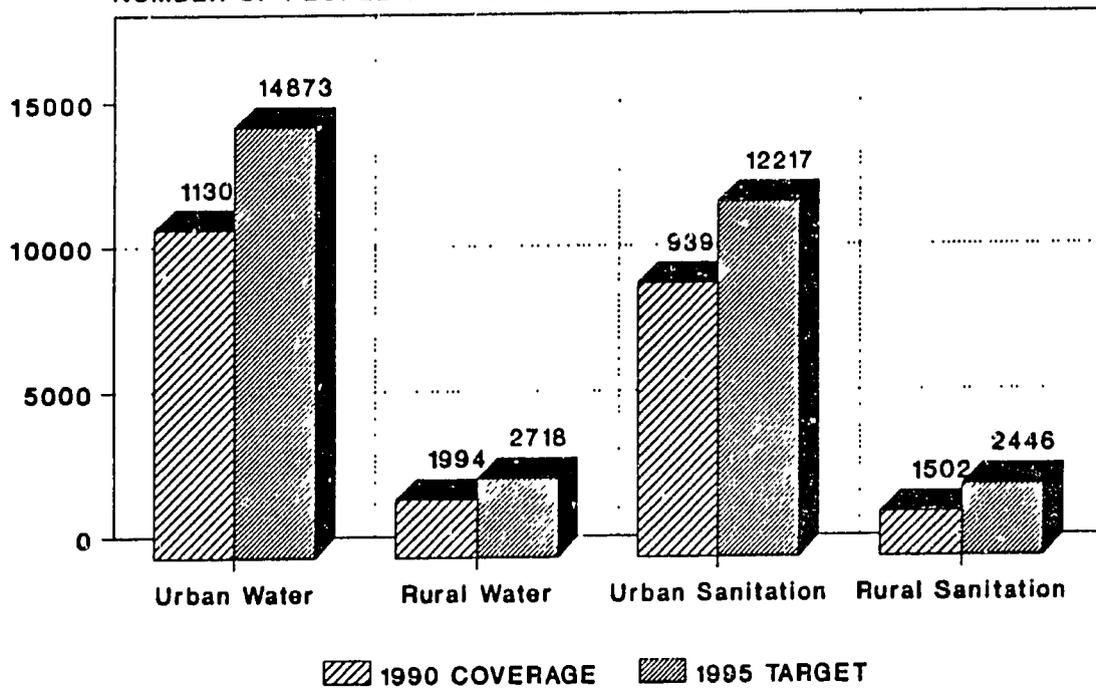


Figure C-3

PERU 1990 COVERAGE AND TARGETS (% OF POP.)

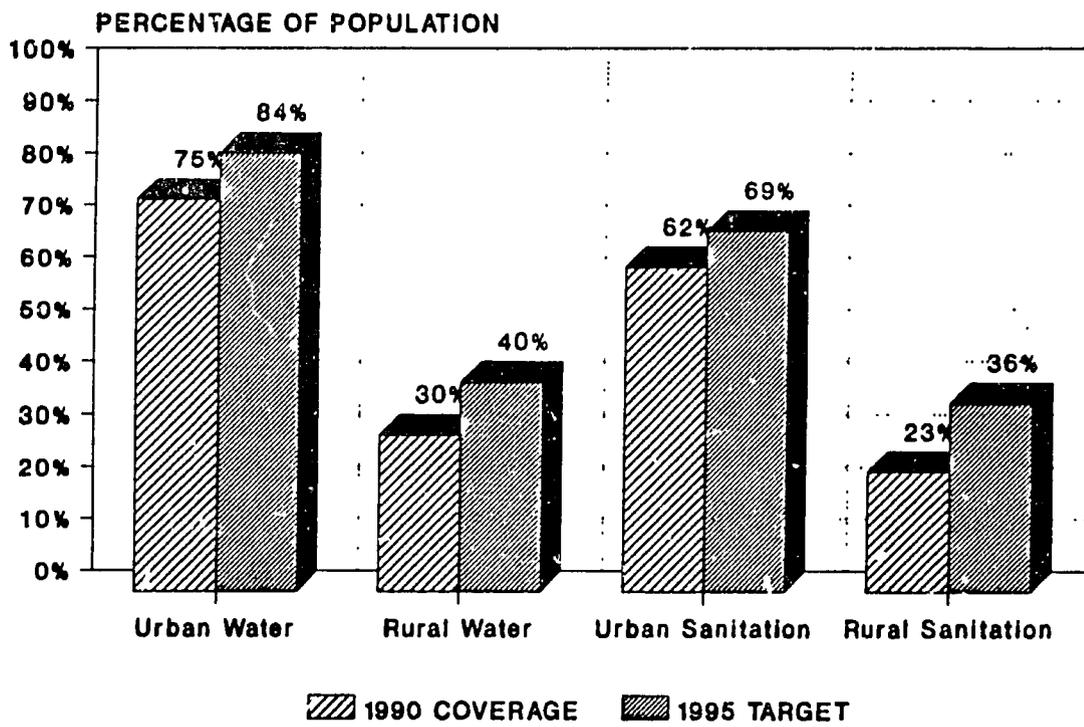


Figure C-4

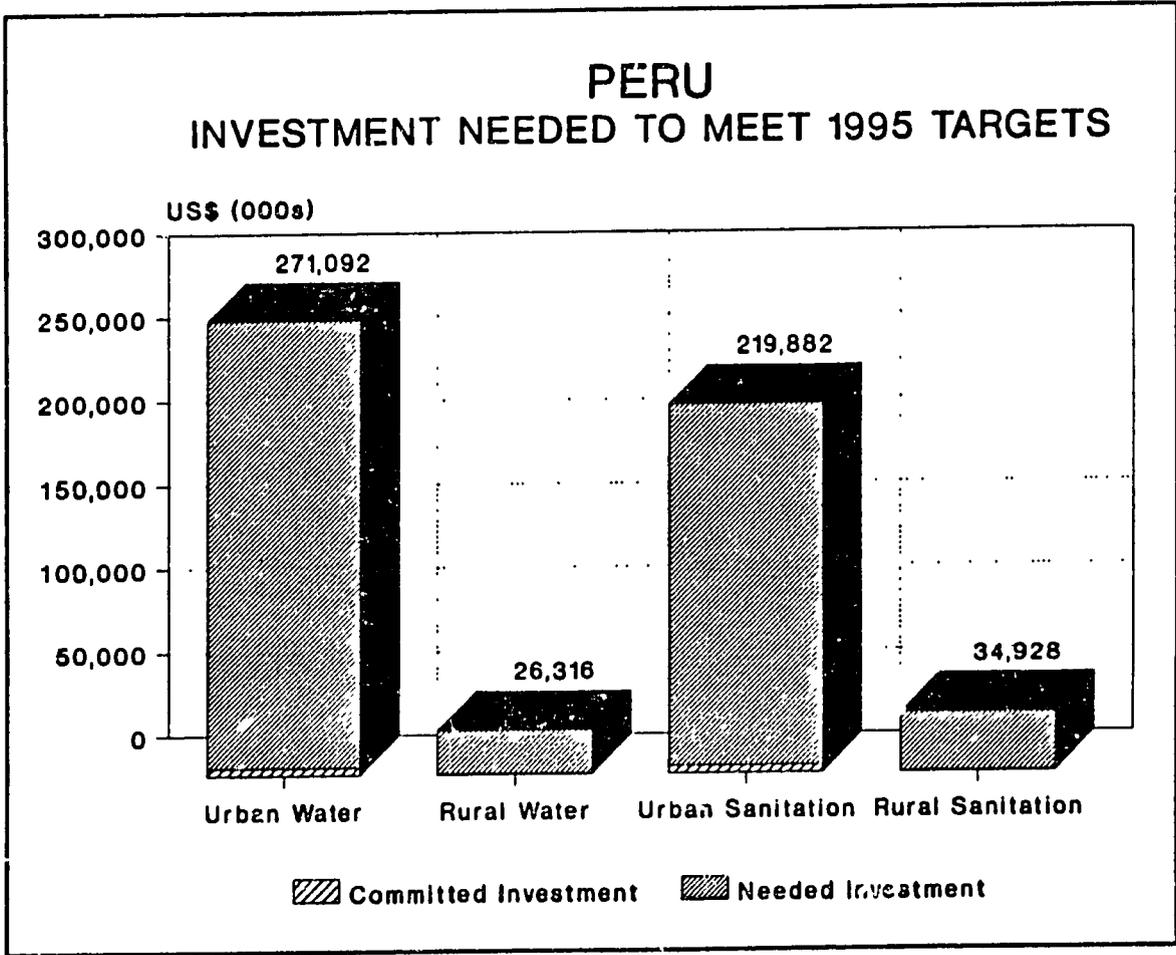


Figure C-5