ISBN 978-92-64-04182-0
Natural Resources and Pro-Poor Growth: The Economics and Politics

PART II

Chapter 10

Water Security and Pro-Poor Growth

Water resources underlie the production of agricultural and industrial goods and services, and their careful development and management are essential to generate wealth, mitigate risks and alleviate poverty. This chapter outlines different mechanisms for effective water management and highlights some key lessons stemming from the experience of industrialised countries. Special attention is given to the politics of water management and institutional development.

10.1. Overview

In all industrial countries, the flows of almost all major rivers are regulated and managed, storing water for multiple uses, reducing peak flows, increasing low flows and protecting water quality, thus reducing the risk of water-related shocks and damage, increasing the reliability of water services for production and reducing other negative impacts, such as disease. Early and large investments have been made in bulk infrastructure and in the human capacity required to operate and maintain these investments. In most cases, the infrastructure platform is mature and the emphasis is placed on water management and infrastructure operations, both to maximise the returns on infrastructure investment and to respond to shifting societal priorities, where increasingly high values are placed on environmental and aesthetic assets. These investments in institutions and hydraulic infrastructure were clearly a pre-condition to *harnessing hydrology* for sustained and broad-based growth and development.

In intermediate economies which are still industrialising, much investment has typically taken place in water infrastructure. In some countries, substantial water investments are being made to promote growth (such as in hydropower and irrigation infrastructure), but the economy is still vulnerable to catastrophic impacts (such as those of floods and droughts). In yet other cases, financing has been available to build infrastructure, but institutional and human capacity is inadequate or has not sufficiently adapted to manage water resources and new infrastructure effectively. These varied circumstances underscore the imperative of balancing and sequencing investment in the institutions and infrastructure required effectively to manage water resources. While it is generally accepted that countries initially will place a premium on physical capital investments, human capacity and institutions can take much longer to build and adapt. The proper balance and sequencing of these investments will therefore be dynamic and highly context-specific. Getting this balance right will be crucial for leveraging and sustaining growth that may now be *hampered by hydrology*.

In least-developed economies, climate seasonality, variability and/or rainfall extremes are often marked, while the capacity, institutions and infrastructure needed to manage and mitigate these potentially major challenges are generally inadequate. Catastrophic hydrological events such as droughts and floods can have dramatic social and economic impacts with declines in annual GDP often exceeding 10% and tragic losses of life (Grey and Sadoff, 2006). What is less apparent is that, as a consequence of widespread expectations that these unmitigated catastrophes will recur, risk-averse behaviour and disincentives to investment become pervasive. Such behaviour can seriously undermine economy-wide investment and growth even in years of good rainfall. In many of the world's poorest countries, climate variability is high, water-related investments are relatively limited, and there is often a strong correlation between rainfall variability and GDP performance. Where economic performance is closely linked to rainfall and run-off, growth becomes *hostage to hydrology* (Box 10.1).

Box 10.1. **Hostages to hydrology**

Ethiopia

Hydrological variability seriously undermines growth and perpetuates poverty in Ethiopia. The economic cost of hydrological variability is estimated at over a third of the nation's average annual growth potential, and these diminished rates are compounded over time. Yet, with much greater hydrological variability than North America, Ethiopia has less than 1% of the artificial water storage capacity per capita to manage that variability. Economy-wide models that incorporate hydrological variability in Ethiopia show that projections of average annual GDP growth rates drop by as much as 38% as a consequence of this variability. In Ethiopia, economic growth is so sensitive to hydrological variability that even a single drought event within a 12-year period (the historical average is every three to five years) will diminish average growth rates across this period by 10%. The effects of hydrological variability emanate from the direct impacts of rainfall on the landscape, agricultural output, water-intensive industry and power production. Because Ethiopia lacks the water resources infrastructure and institutions to mitigate hydrological variability directly, and because it lacks the market infrastructure that could mitigate the economic impacts of variability by facilitating trade between affected (deficit) and unaffected (surplus) regions of the country, impacts are transmitted and even amplified through input, price and income effects on to the broader economy. The overall impact is that Ethiopia's economic growth is tied tightly to the rains.

Source: World Bank (2006c).

Kenya

In Kenya the costs of flood and drought are stark. The La Niña drought of 1998-2000, and the El Niño floods of 1997-98 each had devastating economy-wide and society-wide impacts, as illustrated in an analysis of the financial costs, from government accounts, of these events. The 1997-98 El Niño flood caused damage estimated at 11% of GDP (over three months). Over 90% of the calculated flood losses were associated with transport infrastructure damage (88%) and water supply and sanitation infrastructure damage (5%). The La Niña drought caused damage amounting to some 16% of GDP in each of the financial years 1998-99 and 1999-2000. It is interesting to note that the majority of these losses were associated with foregone hydropower (26%) and industrial production (58%). Agricultural losses associated with the drought accounted for 15% of drought damage, of which 10% were crop and 5% livestock losses. The remaining 6% of losses derived from adverse health impacts. The full economic costs in both cases are probably much greater, because these estimates did not include costs such as those from famine, hunger and malnutrition; losses of lives and rural livelihoods; and risk-averse behaviours, for example relocation of industries or farmers' reluctance to invest in farm inputs such as fertilisers and pesticides. In a recent investment climate study, Kenya is shown to have very low competitiveness, with indirect costs for a firm about three times that of a strong performer. The largest share of the indirect costs is transport (31%) and energy (19%) – which are those sectors most affected by flood and drought. During the period 1998-2000, it is understood that major investors withdrew from Kenya because of unacceptable costs and risks.

Source: World Bank (2004b).

There is a re-emerging consensus that water resources development and management are essential to generate wealth, mitigate risks, and alleviate poverty; that poverty demands that many developing countries will need to make large investments in

water infrastructure at all levels; and that this development must be undertaken building on the lessons of experience, with much greater attention to institutional development, to the environment and to a more equitable sharing of benefits and costs. The challenge of "responsible growth" is to grow, while at the same time embracing both environmental sustainability and social development.

10.2. The potential contribution of water resources management to pro-poor growth

Water resources development and management remain at the heart of the struggle for growth, sustainable development and poverty reduction. This has been the case in all industrial countries, most of which invested early and heavily in water infrastructure, institutions and management capacity. It remains the case in many developing countries today, where investments in water development and management are still an urgent priority.

Four different mechanisms can be described through which effective water development and management play a fundamental role in sustainable growth and poverty reduction.

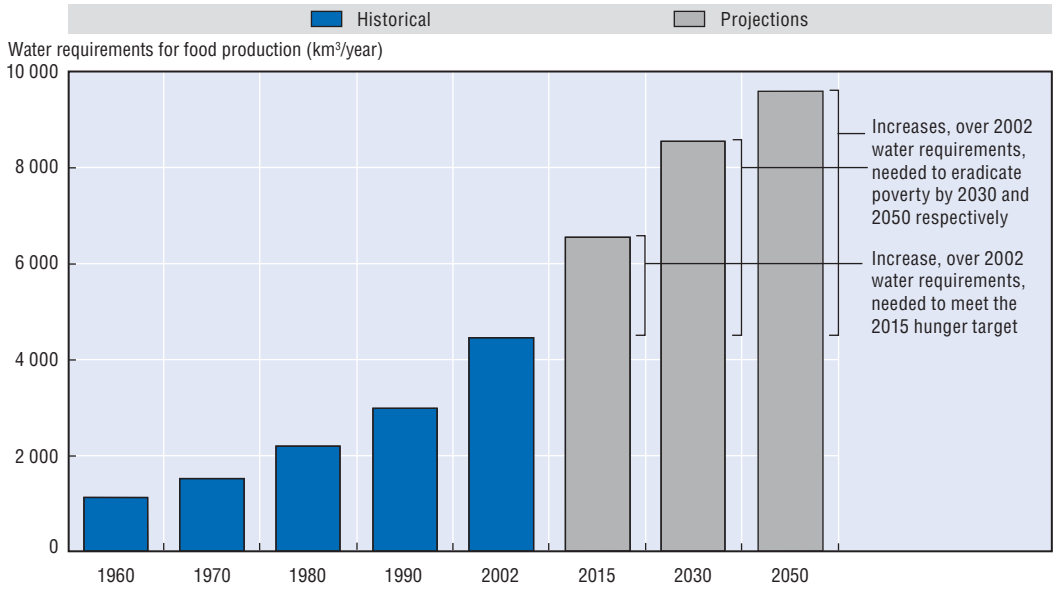
- Broad-based water resources interventions, usually including substantial infrastructure such as major canal systems, dams and inter-basin transfers, provide national, regional, and local benefits from which all people, including the poor, can gain.
- Poverty-targeted water resources interventions are of major importance, such as investments to improve catchment quality and provide livelihoods for the poor, because it is usually the poor who inhabit degraded landscapes.
- Broad-based water service interventions (such as those aimed at improving the performance of water utilities), user associations and irrigation departments benefit everyone, including the poor.
- Poverty-targeted water service interventions, such as water and sanitation and irrigation services for the poor who are not served, play a key role in reaching the MDGs. In most developing countries, growth-oriented, poverty-reducing water resources strategies will involve action in all four of these areas.

Water resources management encompasses water in all its uses, across all sectors. The economy-wide relationship of water with growth and poverty is the aggregate of the effects of water management policies and practices, as well as the contributions to growth of, and inter-relationships between, water use within individual sectors (such as water supply and sanitation, power, irrigated agriculture). It is clear that water use within individual sectors contributes significantly to this relationship, with each having its own welfare, growth, equity and gender implications. For example, decisions regarding whether water supply and sanitation services are to be provided, their location, cost and reliability, can all affect the spatial patterns and rates of growth that result from those investments. This will also be the case for investments in hydropower, navigation and industrial water services. In agriculture, the balance between traditional subsistence agriculture (which generally targets the very poor and provides greater employment opportunities) and highly intensive production (which generates higher value added to a smaller immediate beneficiary group) will significantly affect the market value of agricultural production and the distribution of these gains.

10.2.1. Water for irrigation and growth

For the 2.5 billion people living in low-income countries, agriculture is the most important sector by employment, and by far the largest user of water (World Bank, 2007). Any poverty reduction strategy must therefore take into consideration factors related to food production, coupled with effective water resources management. Irrigated land currently produces 40% of the world's food on 17% of the world's agricultural land (World Bank, 2004c). More effective water management while possibly expanding the irrigated area can have benefits in terms of increased production of (export) crops.

Figure 10.1. **Trends in water requirements for food production**



Source: WRI (2006).

Water used for irrigation agriculture can be a powerful means of reducing food costs among the poor. However, irrigation impact studies focusing only on the benefits at farm level underestimate the overall livelihood impacts of irrigation development. Backward and forward linkages of irrigation in other economic activities may be substantial, as irrigated agriculture can support economic development in rural areas. This may stimulate employment and development of supporting agro-food industries and other off-farm activities (Box 10.2).

Ensure that the poor are allowed access to irrigation water. Access to irrigation water, like land, is heavily biased in favour of wealthy farmers. Specific measures are therefore necessary to ensure that the poor benefit from improved access to water. In many parts of the world, such as Sri Lanka's major irrigation resettlement programmes, women lack land rights to irrigated land, and hence are more likely to face poverty. Water technologies do not have to be large-scale. Interventions of providing access to small-scale water technology to poor farmers can have huge economic benefits. The direct total net benefits of promoting these technologies has been estimated at between USD 100 billion and USD 200 billion for the estimated 100 million farmers who could adopt these tools. When including indirect benefits in the economy, using a multiplier of three, total benefits can increase to USD 300 billion and USD 600 billion (SIWI, 2005a).

Box 10.2. **Irrigation water and economic growth in India: Successful investments in water resource management help India cope with climate variability**

In India, irrigation has been one of the critical components in agricultural growth, rural economic development and the poverty reduction process.

Initial investments in India in water resources management and multi-purpose hydraulic infrastructure had massive regional impacts with large multiplier effects on the economy. It has been suggested that, over the long run, irrigation benefits far transcend the command areas of irrigation systems. The incremental impact of irrigation and other factor inputs on agricultural productivity growth and poverty reduction has been shown to be large. In some areas, more than two thirds of the benefits from irrigation have been captured by the non-farm sector. A case study on macro-level impact analysis in India analyses the incremental impact of irrigation and other factor inputs on agricultural productivity growth and development of agriculture, and in turn their implications for poverty reduction in India. Bhattarai and Narayanamoorthy (2002) found an irrigation elasticity of poverty of 0.27 as a direct impact, and an irrigation elasticity of rural per capita consumption of 0.18 in India. There are also direct correlations between investments in irrigation and significant declines in poverty: irrigated districts average 25% poverty rates against 70% poverty rates in non-irrigated districts. This is also due to the creation of employment and other non-farm sectors' inter-linkage effects.

A combination of infrastructure investment in water management and economic diversification has helped de-link the economy from the monsoon. An Indian finance minister said that in the 1980s "every one of my budgets was largely a gamble on rain". A recent newspaper editorial headline in India said: "Growth surge: no longer a gamble on Monsoon", describing the shift out of agriculture and the expansion of manufacturing, communications and transport which is making the structure of the economy less vulnerable. Still, the variability of rainfall in recent years continues to take a heavy toll across many regions of India, and the 2005 monsoon claimed about 400 lives and caused USD 700 million in damage in Mumbai.

Source: Bhattarai and Narayanamoorthy (2003) and Grey and Sadoff (2006).

10.2.2. Water for hydropower and growth

Hydropower also contributes to economic growth. The 2002 Earth Summit in Johannesburg identified hydropower as one of the major sources of renewable energy. Currently, hydropower provides about 19% of the world's electricity supply, but there are still a limited number of hydropower plants in most developing countries. Hydro-electricity is the key power source of the 26 sub-Saharan countries, and for a further 13 other developing countries it is the second main power source. Hydropower developments can contribute to economic growth through the stimulation of capacity development, increasing the electricity supply of the nation, the related benefits accrued to the economy and through the revenues created through electricity exports. In Bhutan, over 45% of government revenue comes from hydropower exports to India (IMF, 2004). Bhutan's king, His Royal Majesty King Wangchuck, has stated that, "Water is to Bhutan what oil is to the Arabs" (The Hindu Business Line, 15 August 2006, *www.thehindubusinessline.com/2006/08/15/stories/2006081500941000.htm*). In Asia, Laos and Nepal are also seeking to develop their rich water resources, while in Africa Lesotho is developing its hydro exports.

Special measures are needed to ensure that the poor do not suffer the social and environmental costs of large-scale water infrastructure. Dams can displace many existing residents or disrupt their livelihoods. While these kinds of investments are often key in economic and national development, there are also many instances where those displaced – most often the poor – have lost their homes and livelihoods and have not received adequate compensation. There are also several instances where upstream dams have disrupted the downstream livelihoods of poor communities depending on fisheries. This is now a major concern in the Upper Mekong River, which supports a rich fishery downstream.

10.2.3. Water supply and sanitation and growth

Improved water supply and sanitation have also been shown to contribute to growth. This has been measured in several ways.

- *Faster growth in countries with better water access*. The GDP of low-income countries with improved access to safe water and sanitation grew on average at 3.7% per year, whereas the GDP of countries with limited access grew at only 0.1% per year (WHO, 2001).
- *Saving in time*. The largest potential gain of investments in improved water management is found in convenience time saving. Water collection and sanitation access time saved due to improved access has been found to amount to USD 64 billion (SIWI, 2005b).
- *Reduced cost of disease and death*. Meeting the MDG target on water and sanitation could save the health sector annually USD 7 billion. There can be an additional saving of USD 340 million from treatment costs. People can benefit from fewer days lost to illness. Meeting the MDG target on water supply and sanitation has also been estimated to gain 322 million working days per year, and the annual global value of adult working days that could be gained as a result of less illness has been found to amount to USD 750 million. Finally, using techniques to value lost life years, Sachs (2001) estimates that policies aimed at reducing water-related diseases could save 330 million disability adjusted life years (DALYs) by the year 2015. Valuing a DALY at USD 563 at low-income countries revenues, a single year's benefits could amount to USD 186 billion (SIWI, 2005b).

From these figures, it is clear that the economic benefits of improved water supply far outweigh the investment costs. Returns range from USD 3 to USD 34 for every dollar invested, depending on region and technologies employed (SIWI, 2005b).

However, the poor are least well served by public supply and sanitation. This issue, and its policy implications, is addressed in detail in a number of recent publications. Readers are referred to, for example, *Water Governance for Poverty Reduction Key Issues and the UNDP Response to Millennium Development Goals* (UNDP, 2004).

10.3. Ensuring responsible water management

Responsible management of water resources is widely accepted as an imperative not only for sustaining the range of economic services provided by water (irrigation, energy production etc.) but also an imperative for sustaining the livelihoods and well-being of the poorest populations, who are most vulnerable to their deterioration.

In addition, it is increasingly recognised that conserving and enhancing "natural infrastructure" (*i.e.* aquifers, watersheds, lakes and wetlands) is a sound investment, complementing and in some cases substituting for artificial storage, regulation and water

Box 10.3. **Valuing the Zambezi's wetlands as an infrastructure alternative**

Restoring wetlands can increase storage by recharging groundwater, regulating stream flows (thus mitigating floods and drought), reversing changes in the microclimate, and protecting and improving water quality through purification and treatment. However, valuing the associated contribution of wetland biodiversity and critical habitat benefits is often difficult, especially when based on non-use values. A rough assessment by the World Conservation Union (IUCN) on the economic value of wetlands in the Zambezi basin in Southern Africa suggested that there was a net present value of USD 3 million in reducing flood-related damage, USD 16 million in terms of groundwater recharge, and an estimated USD 45 million in water purification and treatment services.

Source: Emerton and Bos (2004).

treatment infrastructure and services, serving the needs of water-using sectors as well as ecosystems (Box 10.3).

This implies recognising that water use can create various kinds of environmental problems which have to be taken into account in water resources management:

- *Over-abstraction of water* (*e.g.* Aral Sea) can create conflicts and tensions among competing users in water-scarce regions. Unsustainable pumping of groundwater (Box 10.4) is a major threat to food security, as 10% of the world's agricultural food production depends on mined groundwater (FAO, 2003).

Box 10.4. **Pakistan and water problems**

Pakistan is predicted to be one of the seven countries most likely to face a serious water shortage by the year 2025. The agriculture sector faces major environmental challenges, including water scarcity in some areas, and waterlogging and salinity in others. In addition, nearly 38% of the Gross Commanded Area (GCA) is waterlogged, of which 15% is severely waterlogged. Of the surface 14% is saline, of which 6% is severely saline. Salinity is estimated to rob farmers of about 25% of the potential production of major crops.

Owing to age, overuse and poor maintenance, the efficiency of delivery of the canal system is low. Moreover, inefficient water delivery and use also mean that, in reality, surface water does not reach many users toward the tail-end of the system. Inequity in the distribution of surface water, as a result of deliveries of less than designed levels, poor operation and maintenance, as well as illegal diversion are major concerns in Pakistan, and most negatively affect the poorest farmers.

Excessive groundwater abstraction, encouraged by electricity subsidies which create incentives for pumping, is another concern. While the situation in each province is different, the impacts are particularly serious for Baluchistan, which has only deep groundwater and almost no surface water. A decline in water tables has reduced access to water for the poor. The most glaring example of this in undermining Baluchistan's collective groundwater is the effect of private tube wells known as *karezes* (a mother well with a string of wells connected by tunnels which will serve over a hundred households which shared the already high costs of installation and maintenance).

Source: Bhatti (1999).

- Over half of the people of India, Pakistan and Bangladesh have, for instance, a livelihood stake in *groundwater irrigation* (Shah, 2004).
- *Pollution* from industry, agriculture and household waste disposal can lead to deteriorating water quality, with serious public health problems in poor communities which do not have access to safe drinking water sources.
- Soil *erosion* through water run-off, coupled with the loss of land along rivers and coasts, can reduce the amount of fertile arable land, and therefore the viability of agriculture, on which many poor people depend. Soil erosion and water run-off also lead to deterioration in roads and waterways as well as coastal fisheries.
- Surface and sub-surface *salinisation*, including saline intrusion into freshwater aquifers threatens agricultural productivity (*e.g.* in Gujarat in India, Java in Indonesia, and Saudi Arabia).

10.4. The politics of water management to promote pro-poor growth

It is also important to understand the impacts of water use across sectors. Water policies and reforms and infrastructure investments in one sector rather than another will have very different consequences for growth and poverty alleviation. For example, irrigation and household water supply and sanitation services have traditionally been seen as pro-poor, whereas investing in hydropower and industrial water supply has traditionally been seen as a strategy for economic diversification and growth.

Clearly these are very broad generalisations, but inter-sectoral water resource allocations will affect the structure of economies, patterns of development and growth (with associated equity and gender implications), and the environment. The allocation of water between the agriculture, power, industry and services sectors will enable or constrain their relative growth, and give rise to very different economies over the medium term, with differing welfare impacts both in terms of overall growth and the distribution of this growing wealth. Moreover, it is quite often the case that the allocation of water and water investments between sectors is the result of political economy rather than deliberate development policy, allowing the "capture" of water resources by powerful interests in ways that hinder opportunities for more effective resource management.

Realising the potential of water as a fundamental resource in a country's economy requires significant efforts, including harnessing the water resource, putting efficient and equitable allocation mechanisms into place, building structures, motivating good performance of water utilities and irrigation districts, and providing for effective drought and flood management. All these actions are interconnected. They require investment in new technologies, infrastructure, management capacity, institutional development and systems of water prices. Furthermore, all these actions and investments have to be coherent with a long-term vision for the sustainability of the resource.

Water is a natural resource that will typically serve the greater benefit of society as a whole, and thus has many possible values. Such impacts explain why governments sometimes subsidise those uses of water that have a high social value, but produce little income. Social concerns may require subsidies, but it is critical that there be transparency. It is therefore a challenge to identify the right balance between water treated as an economic good and water treated as a social good – a balance that is generally only achieved through political processes.

To address the water-related challenges discussed, incentives for reform need to be created. Key incentives originate from the potential for corruption, the degree of transparency in decision making processes and the involvement of stakeholders, creating a system of water rights, establishing a system of water prices and involving external institutions in large-scale developments.

Perverse incentives for corruption. There is often corruption in the provision of water infrastructure and water flows and this inevitably affects the poor, who have the least ability to pay and exert political pressure as compared with the non-poor. Corruption is also a major factor in water resources development. While the construction of dams and large irrigation schemes is motivated by many factors, one factor often overlooked is that improving the efficiency of existing water provision offers much less potential for kick-backs and corruption than awarding contracts for constructing new large scale water infrastructure. Large engineering firms aggressively pursue these contracts, and both they and the government which awards the contract may engage in bribery in the award of the contract. This type of situation can be overcome through transparency in procurement decisions and by ensuring proper assessment of the relative economic cases for new water construction *versus* improving the efficiency of existing infrastructure.

Address politics of unequal access to water services. Social factors such as gender, caste and ethnic discrimination may be key factors that explain reduced access to services in some areas. In India, for example, caste may be a key factor in determining water access. In South Africa the legacy of apartheid has meant that few black families had access to water (Box 10.5).

Box 10.5. **South Africa's water laws and their implementation**

One country that has pioneered a rights-based approach to natural resources is South Africa. In the field of water governance, two new laws were passed. These had to address the lack of water access and inequities in water distribution. In the Mhlatuze basin in Kwa-zulu Natal, more than 97% of resources are allocated to 10% of the population. The Water Services Act provides for access to safe drinking water and sanitation. Uniquely in the world, "free basic water" is provided to a radius of within 200 metres of the household area.

Since 1994, the Department for Water Affairs and Forestry has provided basic water supply to 9 million people. In 2002 alone, 1.2 million people received water supply infrastructure, while 50 000 people received household sanitation. In the process, temporary employment for 25 000 person was created. Over 57% of the population are receiving free basic water. The National Water Act will establish catchment management agencies (CMA) in each of South Africa's 19 water management areas, and these will have functions devolved from the centre. Five CMAs have been gazetted or soon are to be.

Source: www.iwmi.cgiar.org/Research_Impacts/Research_Themes/BasinWaterManagement/Water/Outputs.aspx – 21k.

In many countries women lack rights to land, a factor which reduces the benefits accruing to them from irrigation. Similarly, in many urban areas, poor people lack tenure, reducing their access to water (Box 10.6).

Box 10.6. **Importance of urban tenure for water supply: The example of Guatemala**

Tenure is closely linked to relative improvements in the standard of living for the 25 000 people in the squatter settlement of La Verbana in Guatemala. The settlement received land rights in the 1960s following protests led by a committee for improvement. The result has been access to water, sewerage, drains, and street lighting.

A representative from the local housing department noted: "*I am convinced that the issue of legalisation is the first step in improving housing and working towards overall improvement of the community. Just allowing the people to become owners of the land gives them security of tenure and the guarantee of having something that they can give to their kids.*" In the 1970s some of the community were able to access a water supply. However, with the expansion of the settlement, many remained without service and in 1994, an agreement was negotiated with the municipal water company for each family to pay for a connection and contribute material for pipes.

Source: Grant (2001).

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